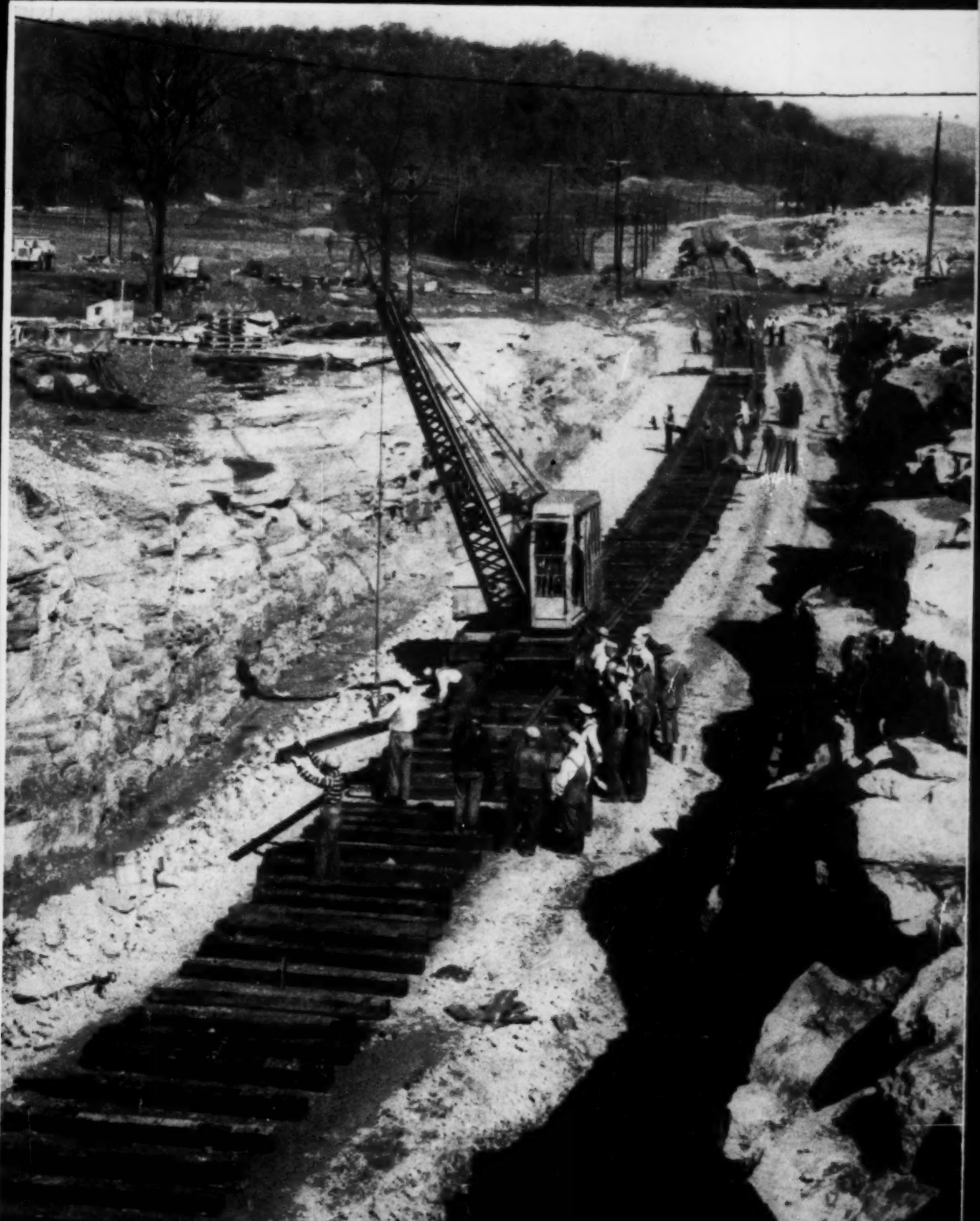
CIVIL
NGINEERING

THE MAGAZINE OF ENGINEERED CONSTRUCTION

pring Meeting
Oklahoma City
pril 20-23, 1949

ified Engineering
Report

AMERICAN
SOCIETY OF
CIVIL
ENGINEERS
FOUNDED
1852



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Branch Offices in Principal Cities
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MARCH 1949
VOLUME 19 NUMBER 3

AMERICAN SOCIETY OF CIVIL ENGINEERS
FOUNDED 1852

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CIVIL ENGINEERING

THE MAGAZINE OF ENGINEERED CONSTRUCTION

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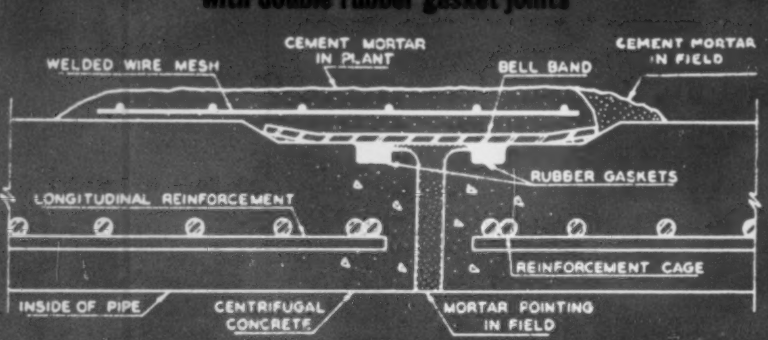
5 BASIC REASONS

why this superior pipe helps reduce the cost of delivered water...

CENTRIFUGALLY SPUN REINFORCED CONCRETE PRESSURE PIPE
with double rubber gasket joints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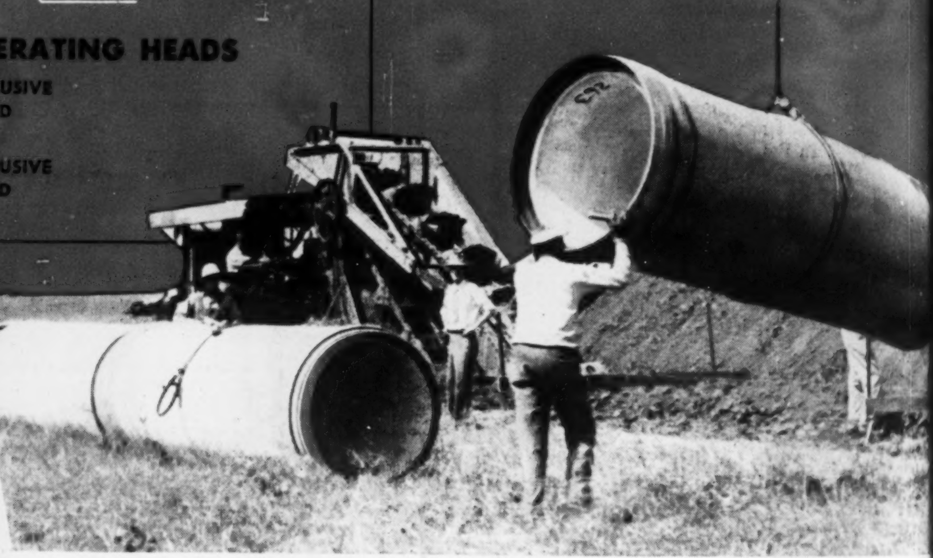

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Main Offices and Plant — 4635 Firestone Boulevard, South Gate, California — District Offices and Plants — Oakland — San Diego — Portland, Oregon

American Society of Civil Engineers
1949 Spring Meeting

Oklahoma City, Oklahoma HOTEL BILTMORE *April 20–22, 1949*

Registration: North Lounge, Biltmore Hotel, Opens 9:00 a.m., Tuesday, April 19

Introduction to Oklahoma City, Wednesday, April 20

10.00 A.M., CIVIC ROOM, HOTEL BILTMORE

Welcome by Oklahoma Section

J. Ray Matlock, Assoc. M. ASCE, President, Oklahoma Section, ASCE; Director of Civil Engineering School, University of Oklahoma, Norman, Okla.

Address of Welcome by Mayor

Allen Street, Mayor, Oklahoma City, Okla.

Response by

Franklin Thomas, President, ASCE; Professor, Civil Engineering, California Institute of Technology, Pasadena, Calif.

What the Civil Engineer Means to Progress

Honorable Roy J. Turner, Governor, State of Oklahoma.

Address, "Some Implications of Effective Engineering"

Dr. Waldo E. Stephens, Authority on International Law and International Relations. Formerly on Faculty of Columbia University, now Vice-President, Stephens Petroleum Co.

Sessions of Technical Divisions, Wednesday Afternoon

Hydraulics Division

2.00 P.M. WEST LOUNGE

Presiding: L. G. Straub, M. ASCE, Chairman, Executive Committee, Hydraulics Division

2:00 **Sounding Sediment Deposits by Supersonic Methods**

C. W. Thomas, Assoc. M. ASCE, Bureau of Reclamation, Denver, Colo.

2:45 **Supersonic Sounding Instruments and Methods**

J. M. Caldwell, Assoc. M. ASCE, Corps of Engineers, Washington, D.C.

3:30 **Methods Used by Soil Conservation Service in Measuring Sediment Deposits**

L. C. Gottschalk, Soil Conservation Service.

3:45 **Determination of Bed Load**

H. A. Einstein, Assoc. M. ASCE, University of California, Berkeley, Calif.

Discussion

City Planning Division

2.00 P.M. PARLOR A

Presiding: Lawrence V. Sheridan, M. ASCE, Chairman, Executive Committee, City Planning Division

2:00 **Development of the Oklahoma City Civic Center**

S. Herbert Hare, Landscape Architect and City Planner, Kansas City, Mo.

2:45 **Replanning of Railroads in Relation to the Development of the City Planner**

Harland Bartholomew, M. ASCE, Planning Consultant, St. Louis, Mo.

3:30 **Economic Aspects of Transportation on City Development**

Discussion

Structural Division

2.00 P.M. EAST ROOM

Presiding: J. M. Garrelts, M. ASCE, Member, Executive Committee, Structural Division

2:00 **Slope Deflection Equations for Curved Members**

Keith T. Fowler, Jun. ASCE, Evanston, Ill.

AERIAL VIEW of Civic Center of Oklahoma City, looking west, tells graphic story of development of city in past decade.

2:45 **Plastic Action of Concrete at High Loads Relieves Stress Concentrations**

ROBERT F. BLANKS, M. ASCE, and DOUGLAS MCHENRY, M. ASCE, of the Bureau of Reclamation, Denver, Colo.

3:30 **Truss Members**

H. E. WESSMAN, M. ASCE, Dean of Engineering, University of Washington, Seattle, and T. C. KAVANAGH, Assoc. M. ASCE, Department of Civil Engineering, Pennsylvania State College, State College, Pa.

Discussion

Social Activities, Wednesday, April 20

12:00 **MEMBERSHIP LUNCHEON, Civic Room, Biltmore Hotel**

It Is Later Than We Think

REV. W. H. ALEXANDER, Minister, First Christian Church, Oklahoma City, Okla.

All members, their ladies, guests and friends of ASCE are cordially invited to attend.

2:30 **TEA for Ladies, Oklahoma Club**

6:30 **RECEPTION, West Lounge, Biltmore Hotel**

7:30 **DINNER, Civic Room, Biltmore Hotel**

9:30 **DANCING, Civic Room, Biltmore Hotel**

DRESS: Optional. Special tickets for Dancing only are available for members of ASCE Student Chapters.

Sessions of Technical Divisions, Thursday Morning

Highway Division

9.30 A.M. EAST ROOM

Presiding: Harold G. Sours, Assoc. M. ASCE, Chairman, Executive Committee, Highway Division

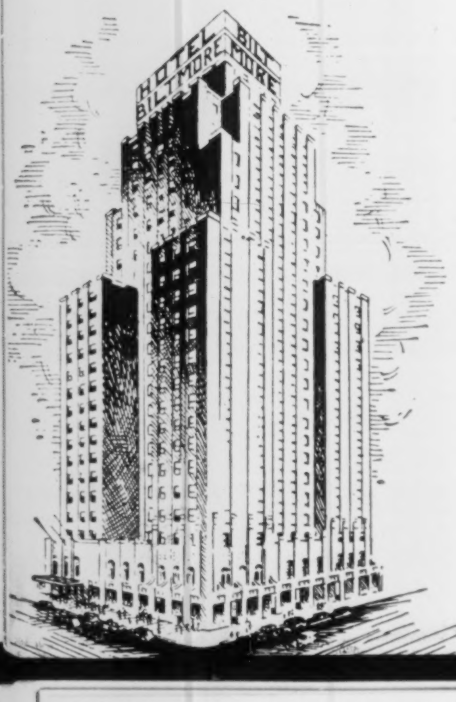
9:30 **Motor Vehicle Sizes and Weights**

H. S. FAIRBANK, Deputy Commissioner, Public Roads Administration, Washington, D.C.

10:15 **Effect of Heavy Loads on Pavement Design**

K. B. WOODS, M. ASCE, Professor, Highway Engineering, Associate Director, Joint Highway Research Project, Purdue University, Lafayette, Ind.

HEADQUARTERS FOR ASCE Spring Meeting in Oklahoma City is Biltmore Hotel, where all sessions of Technical Divisions and many social activities are scheduled to be held.



Air Transport Division

9.30 A.M. PARLOR A

Presiding: Alfred J. Ryan, M. ASCE, Chairman, Executive Committee, Air Transport Division

9:30 **Influence Charts for Concrete Pavements**

GERALD PICKETT, Professor of Applied Mechanics, Kansas State College, Manhattan, Kans.

10:00 **The Effect of Obstructions and Zoning Upon Air Transportation**

ISAAC L. LEDBETTER, JR., Assoc. M. ASCE, Chief, ANF Planning and Control Staff, Civil Aeronautics Administration, Kansas City, Mo.

10:30 **The Future Trend of Air Traffic Control**

GEORGE W. KRISKE, Chief, Air Route Traffic Control Section, Civil Aeronautics Administration, Fifth Region, Kansas City, Mo.

11:00 **The Air Traffic Pattern in the New York Region**

C. EARL MORROW, Chief Planning Engineer, Regional Plan Association, New York, N.Y.

Discussion

Construction Division

9:30 A.M. WEST LOUNGE

Presiding: Ross White, M. ASCE, Member, Executive Committee, Construction Division

9:30 **Construction of Offshore Drilling Platforms with Large-Diameter Pipe Piling**

M. P. ANDERSON, Assoc. M. ASCE, Chief Engineer, Brown & Root, Inc., Houston, Tex.

10:15 **Pipeline Construction**

T. A. HESTER, Vice-President, Oklahoma Contracting Co.

11:00 **Construction of a Gasoline Recycling Plant**

PAUL HALL, Assoc. M. ASCE, Chief Engineer, Fish Engineering Corp., Houston, Tex.

Discussion

MUNICIPAL BUILDING of Oklahoma City, is set in spacious park-like setting.

Sessions of Technical Divisions, Thursday Afternoon

Construction and Sanitary Engineering Division

2.30 P.M. WEST LOUNGE

Presiding: John H. O'Neill, M. ASCE, Chairman, Executive Committee, Sanitary Engineering Division

2:30 **Construction Features at Fort Gibson Dam**

C. H. Chorpening, M. ASCE, Colonel, Corps of Engineers; District Engineer, Tulsa District.

3:00 **The Federal Water Pollution Control Program**

Carl E. Schwob, Chief, Division of Water Pollution Control, U.S. Public Health Service.

3:30 **Protection of Natural Resources Through Planned Disposal of Oil Field Waste**

E. W. Hamburg, Pollution Superintendent, Division of Water Resources, Oklahoma Planning and Resources Board.

4:00 **Oklahoma City Sewage Treatment Plants**

Webster L. Benham, Director, ASCE, Consulting Engineer, Oklahoma City, Okla.

Discussion

Soil Mechanics and Foundations Division

2.30 P.M. EAST ROOM

Presiding: R. E. Means, M. ASCE, Chairman, Oklahoma Section Soil Mechanics Committee

2:30 **Design of Flexible Pavements Based on Results of Triaxial Tests**

H. E. Worley, Assoc. M. ASCE, Kansas State Highway Commission, Topeka, Kans.

Discussion

Chester McDowell, Senior Soils Engineer, Texas Highway Department.

A. W. Johnson, Assoc. M. ASCE, Engineer of Soils and Foundations, Highway Research Board, Washington, D.C.

3:30 **Foundations of Permian Red Clay of Oklahoma and Texas**

James V. Parcher, W. H. Hall, Assoc. M. ASCE, and R. E. Means, M. ASCE, Faculty of Oklahoma A. and M. College.

Discussion

P. M. Geren, M. ASCE, Consulting Engineer, Fort Worth, Tex.

J. D. Piper, Assoc. M. ASCE, Engineer, Portland Cement Association, Dallas, Tex.

Surveying and Mapping Division

2.30 P.M. PARLOR A

Presiding: George D. Whitmore, M. ASCE, Chairman, Executive Committee, Surveying and Mapping Division

2:30 **Control and Property Surveys for Engineering Projects—Requirements and Methods**

E. W. Carlton, M. ASCE, Professor of Civil Engineering, Missouri School of Mines and Metallurgy, Rolla, Mo.

Discussion

W. P. Moore, M. ASCE, Engineering Department, Phillips Petroleum Co., Austin, Tex.

3:15 **Cadastral Maps for the Oil Industry — Requirements and Methods**

Ralph T. McMahon, Magnolia Petroleum Co., Dallas, Tex.

Discussion

George H. Lacy, M. ASCE, Chief Engineer, Gulf Oil Co., Houston, Tex.

4:00 **The Stanoline Elevation Meter-Operation and Results**

Daniel Silverman, Exploration Research Supervisor, Stanolind Oil and Gas Co., Tulsa, Okla.

Discussion

Daniel Kennedy, M. ASCE, Regional Engineer, Topographic Division, U.S. Geological Survey, Rolla, Mo.

Social Activities, Thursday, April 21

12:00 **CONSTRUCTION LUNCHEON**

West Lounge, Biltmore Hotel. Luncheon dedicated to Construction Industry, with speaker from Associated General Contractors of America.

12:00 **LUNCHEON AND STYLE SHOW FOR LADIES**

Empire Room, Black Hotel.

1:30 **OBSERVANCE OF PARADE**

Celebrating 89'ers (Sooners) Day in Oklahoma.

2:30 **EXCURSION FOR LADIES**

Special transportation will be made available leaving hotel at 2:30 p.m. for tour of Oklahoma City.

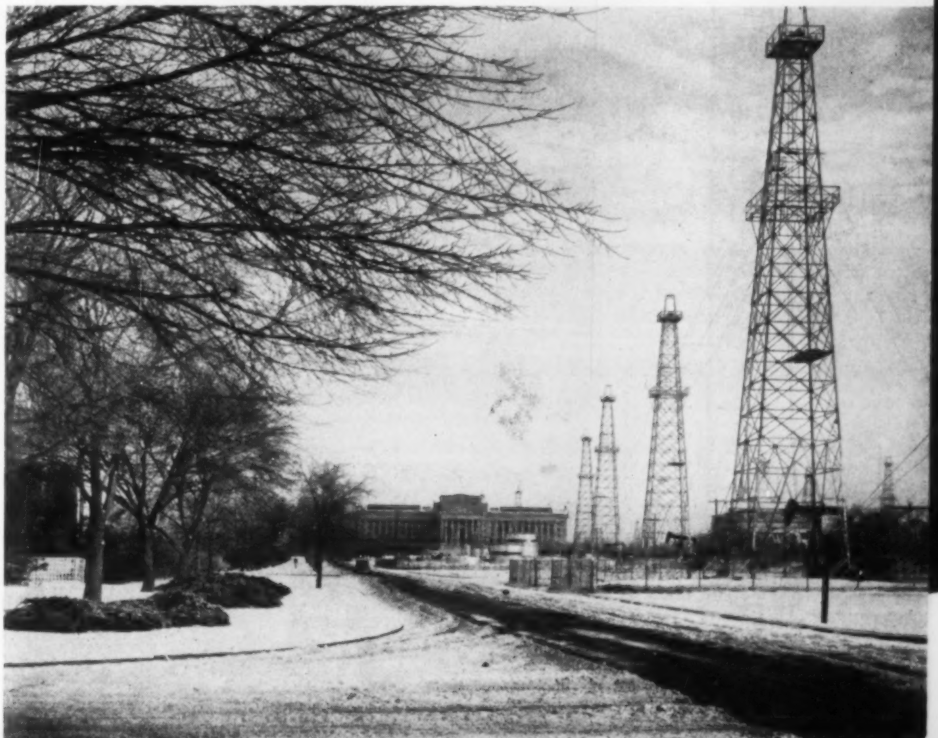
8:00 **MEN'S SMOKER AND ENTERTAINMENT**

Civic Room, Biltmore Hotel. An informal evening of fellowship.

6:30 **LADIES' DINNER AND BRIDGE**

Mirror Room, Biltmore Hotel.

CAPITOL OF STATE OF OKLAHOMA is located in center of large Oklahoma City oil field. Oil wells may be seen in foreground.



Student Chapter Conference, Friday Morning, April 22, 1949

8:00 **Registration, North Lounge, Biltmore Hotel**

8:15 **Student Chapter Breakfast, West Lounge**

Coffee and rolls served without charge.

9:00 **Address of Welcome**

J. Ray Matlock, Assoc. M. ASCE, President, Oklahoma Section, ASCE; Director of Civil Engineering School, University of Oklahoma, Norman, Okla.

Address by Chairman, ASCE Committee on Student Chapters.

Reports from Representatives of Student Chapters on conduct of Student Chapter Activities.

10:00 **Address, "The Relationship Between Industry and the Engineer"**

M. R. Lohman, Assistant Dean, Oklahoma A. & M. College, Stillwater, Okla.

10:25 **Discussion**

10:45 **Address, "Opportunities and Outlook for Jobs in Engineering"**

F. M. Dawson, M. ASCE, Dean of Engineering, University of Iowa, Iowa City.

11:10 **Discussion**

12:00 **Luncheon with ASCE and Oklahoma City Chamber of Commerce**

See Social Activities for Friday.

2:30 **Excursions**

See schedule of excursions below.

Social Activities, Friday, April 22, 1949

Excursions

9:30 a.m. and 2:30 p.m.

Special buses will leave hotel at 9:30 a.m. and 2:30 p.m. Schedule of excursions will be published at the convention.

The following excursions have been planned:

1. **Trip to a Rotary Oil Rig in operation**
2. **Trip to Lakes Overholser and Hefner and visit to Water Filtration Plants**
3. **Trip to Southside Sewage Treatment Plant**
4. **Trip to various construction projects throughout city**
5. **Trip to Tinker Field Air Depot**
6. **Trip to Rodeo at Coliseum**

Joint Luncheon Meeting

12:00 **Silver Glade Room, Skirvin Tower Hotel**

Joint Meeting of Oklahoma City Chamber of Commerce with American Society of Civil Engineers. All members, their ladies, students, guests, and friends are cordially invited to attend.

Toastmaster—Dr. John Abernathy, Assistant Pastor, St. Luke's Methodist Church, Oklahoma City.

Address of Welcome by J. Wiley Richardson, President, Oklahoma City Chamber of Commerce.

Response and Introduction of ASCE Officers and Directors by Franklin Thomas, President, ASCE; Professor, Civil Engineering, California Institute of Technology, Pasadena.

Introduction of guest speakers by Webster L. Benham, ASCE Director, District 14, ASCE, as follows:

Public Works Task Force Report to the Hoover Commission as It Affects Engineers

R. E. Dougherty, Immediate Past-President, ASCE; Consultant, New York Central System, New York, N.Y.

The Sanitary Engineer's Role in Making the World a Better Place in Which to Live

Louis R. Howson, M. ASCE, Consulting Engineer (Alvord, Burdick & Howson), Chicago, Ill.

Irrigation

Royce J. Tipton, M. ASCE, Consulting Engineer, Denver, Colo.

STATE CAPITOL of Oklahoma is point of interest for visitors to ASCE Spring Meeting in Oklahoma City.

Conference of Mid-Western Local Sections

A conference of representatives of Local Sections of ASCE in the Middle West will be held in the Hotel Biltmore on Monday and Tuesday, April 18 and 19, preceding the general meeting.

This conference, while primarily for appointed delegates of the Sections, will be open to any who may be specially interested in the activities of ASCE Local Sections.

Sixteen Sections will participate in this conference.

Hotel Accommodations and Meeting Headquarters

Make Hotel Reservations Early

The Biltmore Hotel in Oklahoma City is the headquarters for the Spring Meeting. Most events, unless otherwise noted, will be held in this hotel. All attending the meeting are urged to make requests for reservation of hotel accommodations as early as possible. Rates are from $3.75 single and $5.50 double, with accommodations in all price brackets.

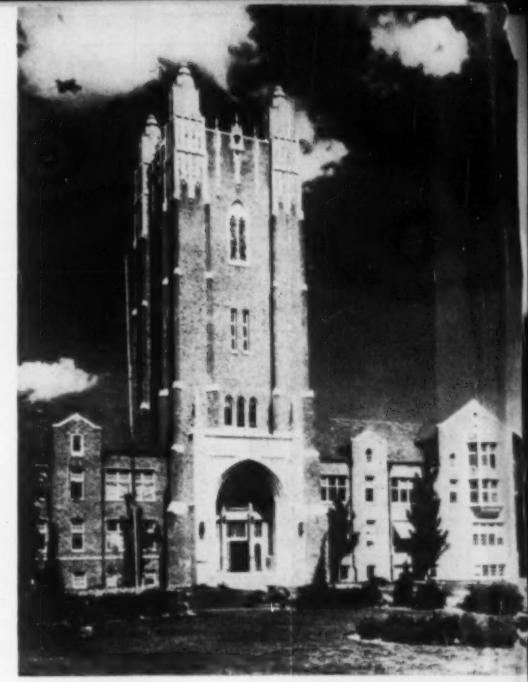
All hotel requests should be mailed to Mr. A. C. Commander, Chairman, Hotel Committee, Care, Manager of Conventions Division, Oklahoma City Chamber of Commerce, Skirvin Tower Hotel, Oklahoma City, Okla. All requests will be acknowledged. Use handy form on page 82.

Information Desk

An information and registration desk will be maintained in the North Lounge of the Hotel Biltmore from 9:00 a.m., Tuesday, April 19, to Friday noon, April 22. Mail will be delivered to members at addresses given in registration or held at the registration desk. All undelivered mail will be forwarded to home addresses at the close of the meeting. A special message service will be in operation at the registration desk.

Ladies' Headquarters

A Womens' Committee Room has been reserved as Ladies' Headquarters for the duration of the Spring Meeting. This room is Reception Suite No. 227. Here the ladies will find a convenient place for meeting their friends, planning their activities, playing bridge, etc. Members of the Ladies' Committee will be on duty to assist with advice on shopping and sightseeing. The ladies are invited to make full use of their headquarters.



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THURSDAY EVENING, DINNER & BRIDGE
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LADIES' RECEPTION AND INFORMATION COMMITTEE
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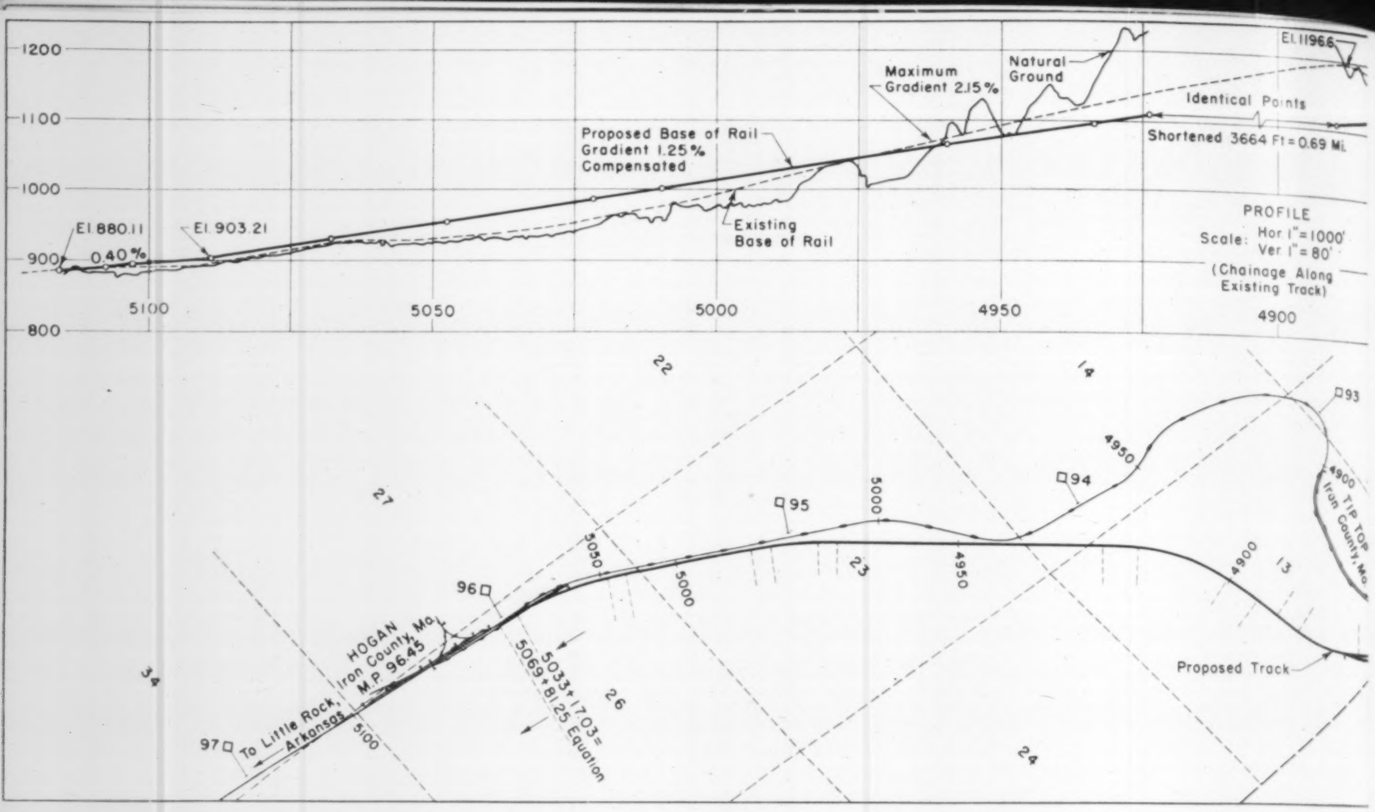
Mrs. Leo L. Laine, *Co-Chairman*


1200
1100
1000
900
800
El. 880.11
0.40 %
El. 903.21
Proposed Base of Rail Gradient 1.25 % Compensated
Existing Base of Rail
Maximum Gradient 2.15 %
Natural Ground
El. 1196.6
Identical Points
Shortened 3664 Ft = 0.69 Mi.
PROFILE
Scale: Hor 1" = 1000' Ver 1" = 80'
(Chainage Along Existing Track)
5100
5050
5000
4950
4900
22
14
27
23
26
24
13
34
□93
□94
□95
96□
97□
4950
5000
4950
4900
5050
5000
5100
4900 TIP TOP Iron County, Mo.
HOGAN Iron County, Mo. M.P. 96.45
To Little Rock, Arkansas
5033+17.03= 5069+81.25 Equation
Proposed Track

Grade and Line Revisions Lower Operating Costs on Missouri Pacific

Railroad Spends 10 Million Dollars on Reconstruction of Primary Lines

ROY P. HART, M. ASCE

Chief Engineer, Missouri Pacific Railroad, St. Louis, Mo.

HANDLING OF HEAVY and increasing traffic emphasized the need of the Missouri Pacific Railroad for faster, more dependable and economical operation on its main lines from St. Louis to Texas and the Southwest. As a result, the railroad is spending 10 million dollars on relocation projects in Illinois and Missouri to avoid increasingly frequent high-water interruptions and to reduce grades and curves for higher speeds. The program now under way has three chief parts—two relocation projects to reduce excessive grades and curvature on its passenger line between Bismarck and Piedmont, Mo., and a 5-million-dollar track-raising program on its freight line between East St. Louis and Thebes, Ill., to put this line above danger of any flood heights along the Mississippi River, even those expected only once in 50 years. This article is based on Mr. Hart's address before the Nineteenth Annual Meeting of the Mid-South Section of ASCE at Little Rock, Ark.

BY REDUCING CURVES and cutting down the hills at Tip Top and Gads Hill on its passenger line to Texas and Mexico, the Missouri Pacific Railroad will soon be able to improve service and, incidentally, to discontinue the use of helper engines which have been necessary on all the heavier passenger trains in the 51-mile distance between Bismarck and Piedmont, Mo. The new grade line with 1.25 percent maximum grades, may even be used by some of the diesel-powered freight trains in place of the heavy-density low-grade freight line built in southern Illinois at the turn of the century to avoid the 2-percent hills now being reduced.

The need to improve operation and reduce operating costs has been accentuated in recent years by the de-

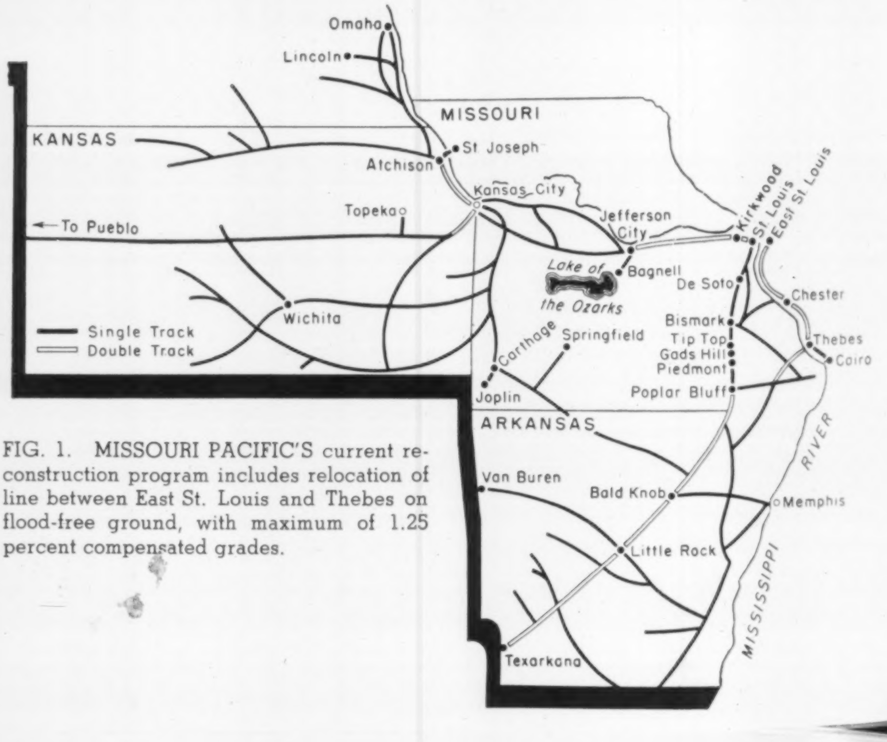

Omaha
Lincoln
MISSOURI
KANSAS
St Joseph
Atchison
Kansas City
Topeka
To Pueblo
Jefferson City
Kirkwood
St Louis
East St Louis
Lake of the Ozarks
Bagnell
De Soto
Chester
Wichita
Single Track
Double Track
Carthage
Springfield
Bismark
Tip Top
Gads Hill
Piedmont
Thebes
Cairo
Joplin
Poplar Bluff
ARKANSAS
RIVER
Van Buren
Bald Knob
Memphis
Little Rock
MISSISSIPPI
Texarkana

FIG. 1. MISSOURI PACIFIC'S current reconstruction program includes relocation of line between East St. Louis and Thebes on flood-free ground, with maximum of 1.25 percent compensated grades.

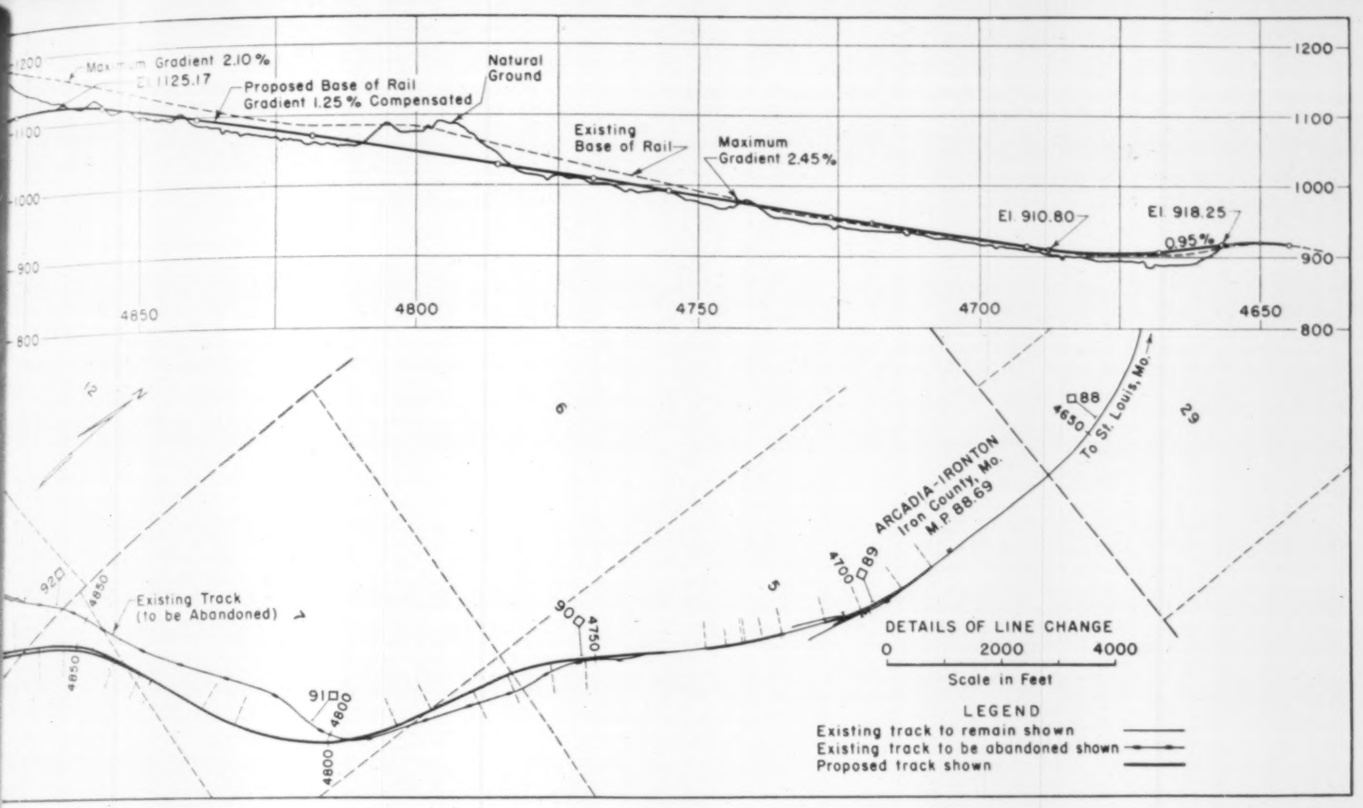

1200
Maximum Gradient 2.10%
El. 1125.17
Proposed Base of Rail
Gradient 1.25% Compensated
Natural Ground
1100
Existing Base of Rail
Maximum Gradient 2.45%
1000
El. 910.80
El. 918.25
0.95%
900
4850
4800
4750
4700
4650
800
N
9
29
□88
4650
To St. Louis, Mo.
ARCADIA-IRONTON
Iron County, Mo.
M.P. 88.69
4700
□89
5
92□
4850
Existing Track
(to be Abandoned)
90□
4750
4850
91□
4800
4800
DETAILS OF LINE CHANGE
0
2000
4000
Scale in Feet
LEGEND
Existing track to remain shown
Existing track to be abandoned shown
Proposed track shown

FIG. 2. TIP TOP HILL track relocation job saves 0.7 miles of distance and 400 deg of curvature at expense of 2 million cu yd of excavation. Dirt excavated by $2\frac{1}{2}$ and $3\frac{1}{2}$-cu yd shovels is hauled maximum distance of $2\frac{1}{2}$ miles in 16-cu yd units.

mand for increased speed, as well as because labor costs have increased while rates have remained low. Better track, stronger bridges and easier grades and curves have become necessary not only for the greater speeds, but to make both ends meet.

Three Projects Under Way

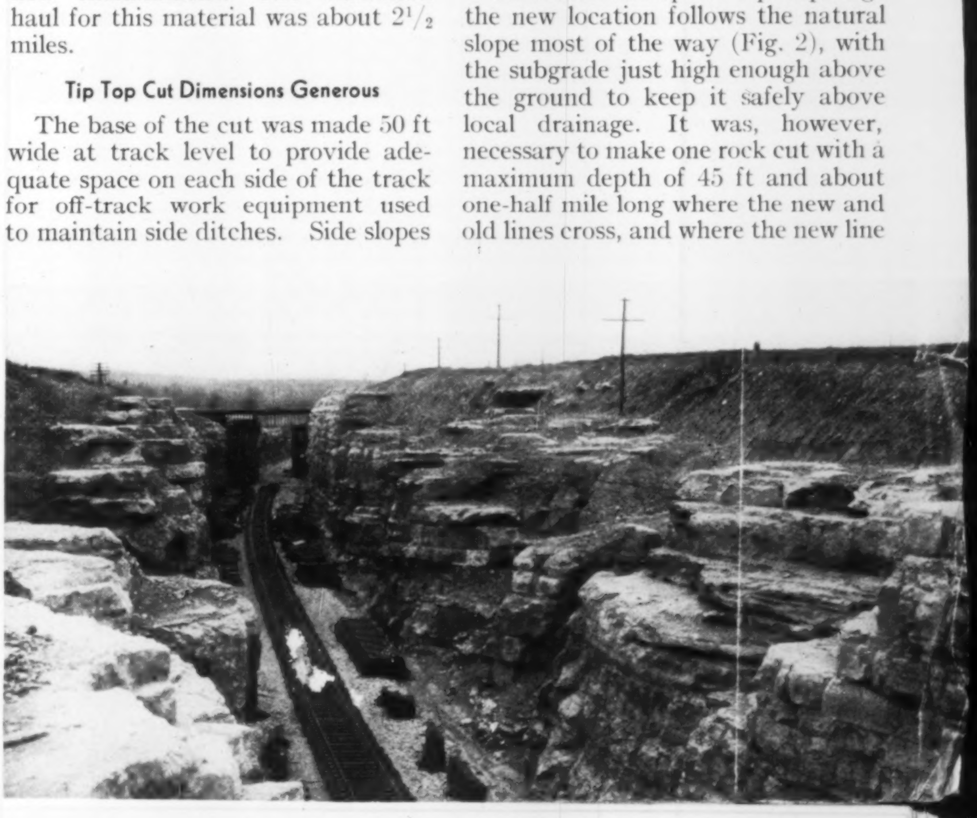
Probably the most interesting of the three large projects now under way on the Missouri Pacific lines (Fig. 1) are those at Tip Top and Gads Hill, the former now nearing completion. These points are located on the fast passenger line, and since other grades on the line from St. Louis to Poplar Bluff, Mo., were 1.25 percent or less, the hills at Tip Top and Gads Hill have been cut down, both northbound and southbound, to 1.25 percent compensated. All but two of the curves are 1 deg 30 min or less, the two being held to 2 deg. Old grades over Tip Top were 2.45 percent southbound and 2.15 percent northbound, and the maximum curve was 8 deg 6 min. Over Gads Hill grades were 1.8 percent southbound and 1.55 percent northbound and the maximum curve was 5 deg 27 min.

The main cut at Tip Top (Fig. 2) is about 4,000 ft long and has a depth at the crest of 150 ft. Soundings made before work was started indicated the presence of only a small amount of solid rock in this cut. As the work progressed this was found to be true, although walls of solid granite and porphyry are in full view along State Highway 21 only about a mile to the south. Material in the Tip Top cut consists primarily of compacted clay, gravel and boulders, bedded so firmly that blasting was employed to permit easier loading with $2^1/_2$ and $3^1/_2$-cu yd shovels. Excavated material totaling nearly 2,000,000 cu yd has been hauled south an average of over 6,000 ft with 16-cu yd hauling units, most of the material being used to provide new embankment. The maximum haul for this material was about $2^1/_2$ miles.

Tip Top Cut Dimensions Generous

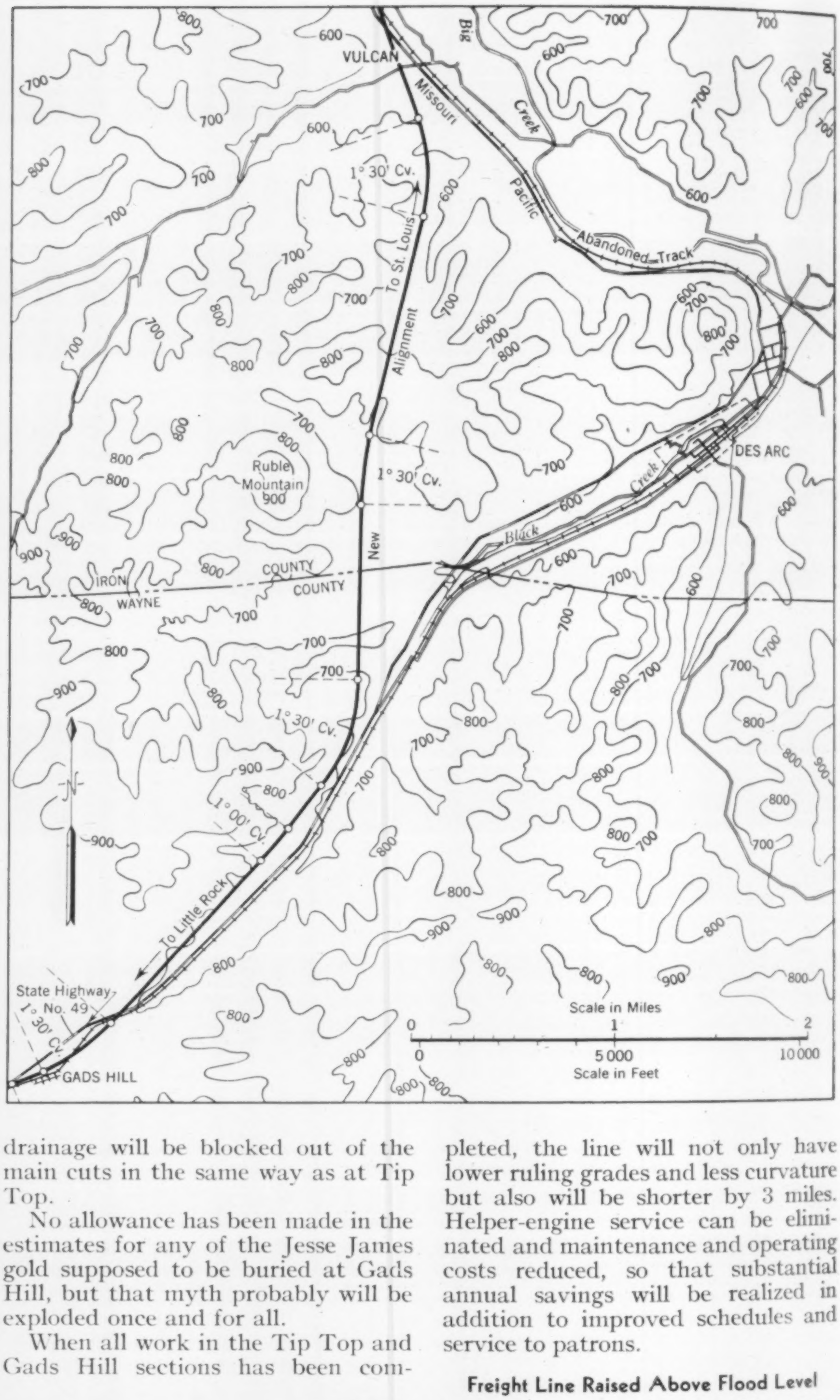
The base of the cut was made 50 ft wide at track level to provide adequate space on each side of the track for off-track work equipment used to maintain side ditches. Side slopes were made $1^1/_2$ to 1. Although this may seem rather steep for a cut having a maximum depth of 150 ft, the character of the material is such that no great difficulty is expected in future maintenance. In order to limit the amount of drainage flowing down these slopes to track level, the excess of excavated material was wasted in the draws between the spurs of the hills on each side of the cut and levees were built along the top of the cut on each side to divert all hill drainage to natural ravines on each side of the ridge.

On the north slope of Tip Top ridge the new location follows the natural slope most of the way (Fig. 2), with the subgrade just high enough above the ground to keep it safely above local drainage. It was, however, necessary to make one rock cut with a maximum depth of 45 ft and about one-half mile long where the new and old lines cross, and where the new line



NEW LINE IN ROCK CUT at north end of Tip Top Project in Missouri crosses under old line, carried on temporary bridge.

FIG. 3. TRACK REALIGNMENT at Gads Hill in Ozark Mountains eliminates need for helper engines but requires heavy cuts and fills.



is 37 ft below the old (see accompanying photograph). At this crossing excavation was first performed on one side of the operating track. Then the track was placed on a temporary falsework bridge across that part of the cut already made. Finally the new cut was excavated on the other side of the track.

Most of the track has now been constructed on the new roadbed and 9,000 ft has been placed in service on the new fill to the south, with the grades of the new and old lines intersecting about half way down the south slope. It was expected that all of the new line could be placed in service before the end of 1948, but frequent and heavy rains during November retarded grading in the bottom of the main cut. The new line is 0.7 mile shorter than the old one in this section and has 414 deg less curvature. Bridge and culvert construction, as well as track work and fencing, is being handled by company forces, but grading is being done by contract.

Second Major Section Is Under Way

The second major section of this program is between Vulcan and Gads Hill (Fig. 3), a distance of 9½ miles, where construction is now getting under way. About 1½ million cu yd of common and solid-rock excavation is involved. Besides reducing the heavy grades, this project will shorten the line by 2.29 miles and eliminate 434 deg of curvature. The maximum curve on the new line in this section will be 1 deg 30 min.

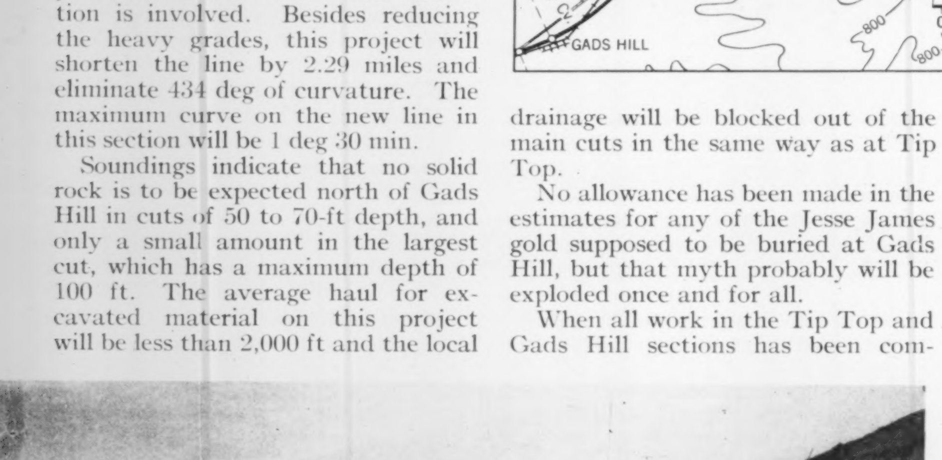
Soundings indicate that no solid rock is to be expected north of Gads Hill in cuts of 50 to 70-ft depth, and only a small amount in the largest cut, which has a maximum depth of 100 ft. The average haul for excavated material on this project will be less than 2,000 ft and the local drainage will be blocked out of the main cuts in the same way as at Tip Top.

No allowance has been made in the estimates for any of the Jesse James gold supposed to be buried at Gads Hill, but that myth probably will be exploded once and for all.

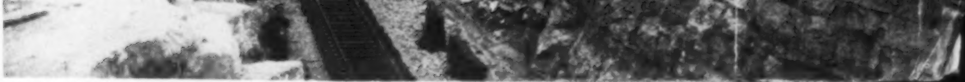
When all work in the Tip Top and Gads Hill sections has been completed, the line will not only have lower ruling grades and less curvature but also will be shorter by 3 miles. Helper-engine service can be eliminated and maintenance and operating costs reduced, so that substantial annual savings will be realized in addition to improved schedules and service to patrons.

Freight Line Raised Above Flood Level

The third important project is the raising of the heavy-traffic double-track freight line in Illinois (Fig. 1), which was built about forty years ago on a grade line above ordinary high water. It was built to bypass the above-mentioned passenger line through the Ozarks, and it is a coin-



CONTRACTOR USES 3½-yd dragline on line and grade revision at Tip Top, Mo., on Missouri Pacific's main line to Texas and Southwest.



cidence that both lines are being revised at the same time.

Although for many years little trouble was caused by floods, levee construction and other improvements along the Mississippi have now so restricted the channel that flood heights have been raised and railroad operation is no longer dependable during flood periods, traffic having been suspended for periods of more than two weeks in 1943, 1944 and 1947.

Program Between East St. Louis and Thebes

To avoid the recurrence of such traffic interruptions, a dependable main-line program has now been undertaken in cooperation with the Corps of Engineers on the 119 miles of line from East St. Louis to Thebes, at an estimated cost of nearly 5 million dollars. Except for 20 miles in the vicinity of Chester, a chain of levee districts, designed to protect rich farm lands and various towns, will also afford protection to the railroad, provided the tracks are raised at levee crossings and over the intervening local waterways.

While the Corps of Engineers is raising and improving the levees around the various levee districts and raising the tracks at levee crossings, the railroad is engaged in relocating and raising the 20-mile section through Chester, constructing the new embankment with selected fill material from the adjacent hills. Track rises at levee crossings vary from 4 to 12 ft, and the grade line of the new track in the Chester reach will be from 1 to 15 ft above the old grade line.

When this project is completed, some three or four years hence, the 119-mile division having the Missouri Pacific's heaviest freight traffic will either have levee protection or will be above any expected flood of the Mississippi, even those floods expected to occur only once in 50 years.

Early Efforts to Improve Transportation

In connection with the Missouri Pacific's present improvement program, a brief review of the history of the road may be of interest. More than a century ago efforts were begun to provide better and more dependable transportation for St. Louis and the West and Southwest than was afforded by the rivers, oxcarts and stage coaches of that day. The Missouri Pacific Lines are the direct successor, not only of the first railroad actually put in operation west of the Mississippi, but also of several others begun only a few years later.

The Pacific Railroad was chartered March 12, 1849, to build a railroad west from St. Louis to the western boundary of Missouri "and thence to the Pacific Ocean." The first chief engineer, James P. Kirkwood, was a leader of his day. In 1852 he helped to found the American Society of Civil Engineers, of which he became the second president.

Mr. Kirkwood recommended a gage of 5 ft 6 in. for the new railroad on the assumption that the first railroad west of the Mississippi was free to select the gage best suited to the mechanics of the problem, as a railroad bridge across the mighty Mississippi was then considered fanciful. The 5-ft 6-in. gage was adopted by the Missouri legislature and made mandatory for all railroads in the state. It was also adopted by the earliest Texas railroads and perhaps should have been retained as standard. Just this last summer, at the start of the Chicago railroad fair, when various railroad presidents were called upon to suggest what changes in early railroad practice they felt would have been desirable in the light of present-day conditions, Ralph Budd, M. ASCE, president of the Burlington Lines, expressed the opinion that it would have been better if the gage had been standardized at 5 ft 6 in.

Initial Importance of Low First Cost

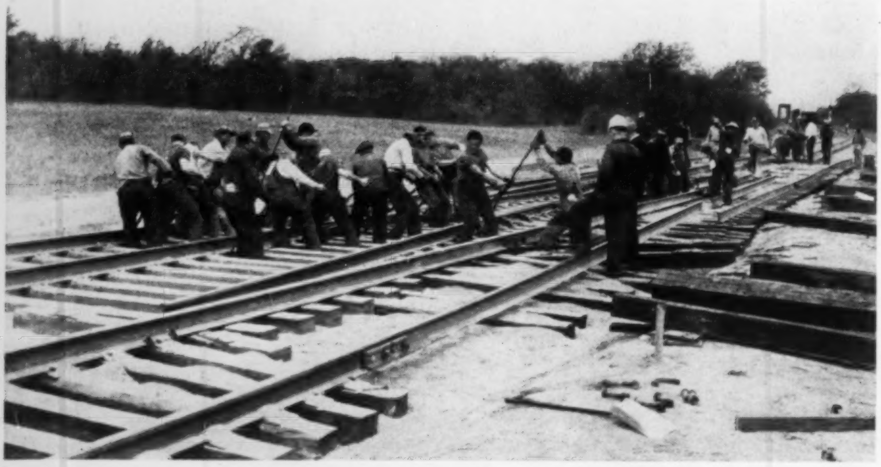
In the early days of the Missouri Pacific, as well as of other railroads, low first cost was of greater importance than economy of operation. Unless a railroad could be cheaply built, it usually could not be built at all. High operating costs could be tolerated, at least until the pioneer railroad had permitted settlers to come in and traffic to be developed, because freight and passenger rates were high. Even with these high rates, the costs for both passengers and freight were far less on the railroad than by other means of transportation then available.

As the country became developed and traffic increased, the situation changed and it became necessary to improve operation and reduce operating costs. Labor costs tended to increase and rates to decline. Programs to reduce the effect of heavy grades began in the 1880's. The so-called "River Route" along the Missouri River, between Jefferson City and Kansas City, was such a project although it was not completed until the turn of the century. Another project considered was the construction of a new line from St. Louis southward to avoid the heavy grades of the Ozarks.

Further Study of Grade Reduction

By the beginning of the twentieth century, traffic had increased so much that further study was given to the reduction of grades on the existing line across the Ozarks from De Soto to Piedmont, Mo. But the estimated cost of reducing these grades below 1 percent was found to be so high that it could not then be justified, and it was decided instead to build a low-grade line on the east side of the Mississippi. This Illinois line, built on a 0.3-percent grade, has become the Missouri Pacific's heaviest freight-traffic line. Although part of it is single track, it was not uncommon for 85 trains a day to move over it during World War II, including trains operated by the Cotton Belt Railway. The single-track portion is operated with centralized traffic control, so that no train orders are necessary. This method of operation,

MAIN CUT AT TIP TOP, MO., is 4,000 ft long and when completed will have depth of 150 ft. Shovel working at 60-ft depth loads compacted clay, gravel and scattered boulders into 16-cu yd haulage units.



CREW LIFTS TRACK between trains on Illinois division of Missouri Pacific at Reilly Lake, between East St. Louis and Thebes, Ill., as part of 5-year program to raise tracks above 50-year flood stage of Mississippi River.

TRIPLE-BARRELED concrete culvert carries drainage under unfinished fill for Missouri Pacific line relocation south of Tip Top Hill.

originated on the Missouri Pacific, is one of the most important transportation developments in many years.

Improvements to Western Lines

By 1931 the Missouri Pacific had constructed a second main track for a distance of 110 miles from Jefferson City to a point about 4 miles west of Kirkwood, a suburb of St. Louis. Grades of about 1 percent on each side of Gray Summit were reduced under this program to 0.3 percent eastward and 0.5 percent westward. The line was shortened over 3 miles and a large amount of curvature was eliminated.

In 1929 a grade and line revision program was also started in Kansas, on the line to Colorado, to improve the handling of California and Colorado perishable freight through the Pueblo gateway. The western part of this line had grades of 0.7 percent eastward and 1.1 percent (momentum) westward, the majority of the tonnage normally moving eastward. The eastward portion of the original line, through the flint hills of Kansas, had maximum grades of 1.5 percent in both directions.

Work on this line was completed in 1932. The new grades of 0.7 percent eastward and 1.0 percent westward permitted handling 3,500 tons instead of 1,820 tons in trains moved eastward. Curves were reduced from a maximum of 6 deg to a maximum of 2 deg 30 min. Today maximum curves of 1 deg 30 min would probably be used to permit increased speeds. All trains on this line are now being handled with diesel engines; a 3-unit engine of 4,050 hp now moves 6,000 tons in eastward trains.

This program cost more than 6 million dollars and the greatest benefit from it came during World War II when there was a heavy flow of traffic westward as well as eastward. In fact, during the war the normal preponderance of tonnage was reversed from eastward to westward.

Improvements Effected During War

War traffic to the West again directed attention to the line between St. Louis and Kansas City, as there still remained 3 miles of single track, on an 0.85-percent grade, through the two tunnels at Barretts, the first tunnels built west of the Mississippi, which also had limited clearance. In addition there were some troublesome overflow problems near Pleasant Hill and poor grade and alignment in the Little Blue River valley close to Kansas City.

In the war years between 1943 and 1947 these conditions were corrected. A new double-track line was built through rock cuts 70 ft deep to bypass the two old tunnels west of Kirkwood, and centralized traffic control was installed on the new line to give greater efficiency in the handling of traffic.

Tracks near Pleasant Hill were raised above flood stages and grade and line revisions were made across the Little Blue River valley. The change at Little Blue involved raising some sections of track, excavating through several rock and shale cuts 40 to 50 ft deep, and the building of five grade separations with county and state highways. The result was the reduction of maximum curves from over 5 deg to 1 deg 30 min, with the elimination 398 deg of curvature, the reduction of grades from a maximum of 1.7 percent eastward and 1.6 percent westward (non-compensated) to a maximum of 1.25 percent compensated, and the shortening of the line by nearly $^1/_2$ mile. The total cost of this latest St. Louis to Kansas City program was over $2^1/_2$ million dollars.

Heavy Work Between St. Louis and Little Rock

Concurrently with the work just described on the line to the West, progress was made in improving the alignment of the passenger line through the Ozarks, already mentioned. This line runs more or less parallel to Black River from Piedmont to Poplar Bluff and is subject to some overflow during flood stages in the river.

Beginning in 1944 and extending into 1947, work costing over $900,000 was performed in the vicinity of Hilliard and Granite Bend, where 7 miles of line were placed above the highest flood level and curves were reduced from a maximum of 6 deg 11 min to 2 deg, while eliminating 257 deg of curvature and effecting a reduction in distance. An interesting feature of this work was the excavation of about 40,000 cu yd of extremely hard porphyry in one of the cuts at Granite Bend. Drilling of this rock for blasting was extremely slow, one drill bit lasting only for the drilling of 15 in. of hole even though cooled by a continuous flow of water.

Additional projects along Black River in the vicinity of Williamsville, between Piedmont and Poplar Bluff, remain to be carried out at a later date in order to have the entire line above overflow level.

The present track relocation program of the Missouri Pacific is being carried out under the general supervision of the writer with the able assistance of the engineer of design, W. H. Giles, the full cooperation of the chief operating officer, R. C. White, and the over-all guidance of the chief executive officer, P. J. Neff, all Members of ASCE.

Unified Engineering, with Cabinet Status, Urged in Government Reorganization

Hoover Commission Task Force Anticipates Increased Efficiency from Federal Department of Works

HEADED BY ROBERT MOSES, New York City and State Park Commissioner, Construction Coordinator of New York City, and Chairman, Triborough Bridge and Tunnel Authority, the 33-man Public Works Task Force, in its report to the Hoover Commission appointed by Congress to report on the reorganization of the executive branch of the government, emphasizes the increased efficiency and attendant economy, both in peace and in war, that would result from unified engineering counsel on engineering problems. While 21 of the 34 advisers and consultants are members of ASCE, the Society has taken no official position on the Task Force's recommendation for the consolidation of works functions in a new Department of Works of Cabinet rank.

A CABINET-RANK Department of Works should be created to assimilate all federal engineering and related functions, including a Special Board of Impartial Analysis, comprised of engineers, to investigate every major proposal affecting water development and control, and promotion and conservation of natural resources.

These proposals are among the major recommendations made by a Public Works Task Force to the Hoover Commission on Organization of the Executive Branch of the Government, which is scheduled to complete its report to Congress by March 13. Another significant suggestion made by this Task Force, one of several such subcommittees of the Hoover Commission, is that the proposed Secretary of Works, as well as the Secretary of Defense, be given representation on the Atomic Energy Commission which, as now constituted, is a purely civilian organization, divorced from Presidential authority.

The report states that it is logical and in the interest of good government to bring within the purview of a single federal department all engineers engaged in federal works. It is pointed out that the principles underlying the organization of such federal departments as Agriculture, Justice and Defense, for example, follow the same pattern—the unification, by departments, of federal employees of required special qualifications.

Heavy stress is laid in the report on the advantages of providing unbiased engineering advice to the nation under a single-engineering-department plan designed to dispel any conflicts arising from divergent loyalties which may exist under the present multiple-engineering-department system.

"A well-selected, expert, central engineering group, representing the President and respected by Congress and the country generally, as well as by scientists and technicians, would be invaluable in passing initially on disputed projects like the Nicaragua Canal, Florida Ship Canal, St. Lawrence Seaway and Power Installation, Missouri Valley Development and Passamaquoddy," the report points out. "It is true that each of these projects involves other considerations besides engineering, such as diplomacy, local politics, trade, shipping, defense and banking, but the basic test of feasibility remains an engineering matter.

"It would be worth a great deal to the country to have a thorough, factual, unbiased report by the sea-green incorruptibles of the engineering profession on all major construction projects, especially if such a report were couched in plain, ordinary, Anglo-Saxon English, understandable by the average layman. We have, therefore, recommended, as a most important feature of the Division of Water Control and Development in the new department, a board of three experts to be known as the Board of Impartial Analysis. The members of this board would be appointed by the Secretary of Works and they would be responsible for a complete detached investigation of all aspects of every major proposal affecting water development and control, promotion and conservation of natural resources."

The Division of Water Control and Development is one of four major divisions in the six-division plan recommended by the Task Force. As shown in the accompanying chart. Fig. 1, the other three major divisions, each of which would be headed by an

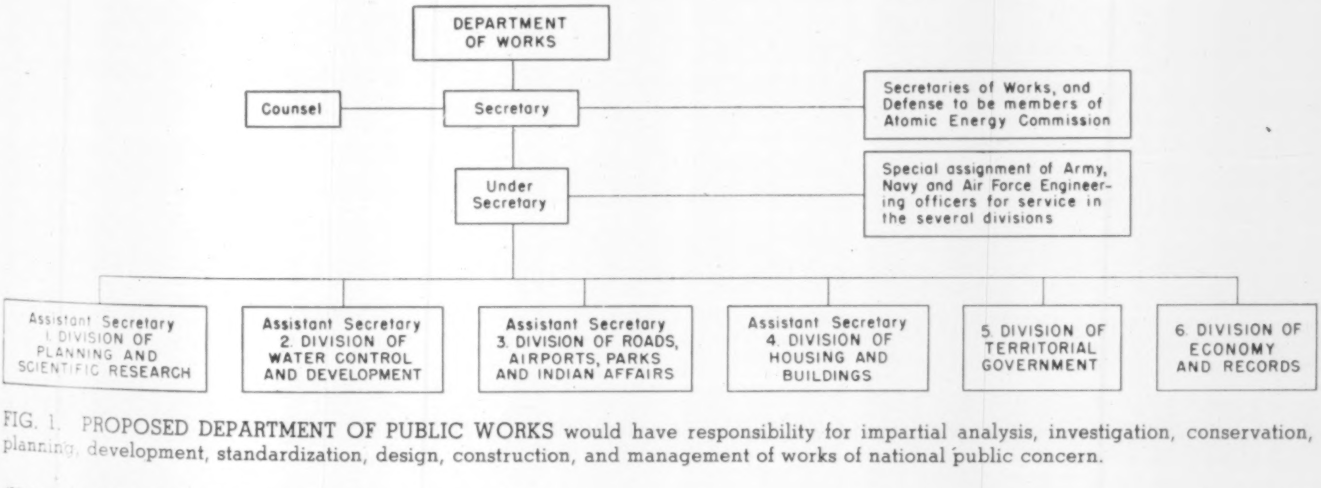

DEPARTMENT OF WORKS
Counsel
Secretary
Secretaries of Works, and Defense to be members of Atomic Energy Commission
Under Secretary
Special assignment of Army, Navy and Air Force Engineering officers for service in the several divisions
Assistant Secretary 1. DIVISION OF PLANNING AND SCIENTIFIC RESEARCH
Assistant Secretary 2. DIVISION OF WATER CONTROL AND DEVELOPMENT
Assistant Secretary 3. DIVISION OF ROADS, AIRPORTS, PARKS AND INDIAN AFFAIRS
Assistant Secretary 4. DIVISION OF HOUSING AND BUILDINGS
5. DIVISION OF TERRITORIAL GOVERNMENT
6. DIVISION OF ECONOMY AND RECORDS

FIG. 1. PROPOSED DEPARTMENT OF PUBLIC WORKS would have responsibility for impartial analysis, investigation, conservation, planning, development, standardization, design, construction, and management of works of national public concern.

Assistant Secretary, are Division of Planning and Scientific Research, Division of Roads, Airports, Parks, and Indian Affairs, and Division of Housing and Buildings. Two other divisions suggested by the Task Force are Division of Territorial Government and Division of Economy and Records. The Assistant Secretaries assigned to the four major divisions would be appointed by the Cabinet-member Secretary of the Department of Works who, like the Undersecretary recommended, would be appointed by the President of the United States with the advice and consent of the Senate. The Task Force recommends that the Assistant Secretaries be appointed by the Secretary "preferably without Senate confirmation," explaining that "many qualified persons might be willing to undertake public service if they were assured of immediate appointment without the added burden of confirmation. It is recommended that the salary of the Secretary be $25,000 a year, the Undersecretary $20,000, and the Assistant Secretaries $15,000 each."

Of particular interest to ASCE members are those portions of the report which deal with subjects which long have been of major concern to successive Boards of Direction of the ASCE on behalf of members both in and out of government service. These matters are taken up under the headings: "Consolidation of Functions Relating to Water Control and Development," "Central Engineering Advice to Domestic and Foreign Loan Agencies," "Special Problems Relating to the Assignment of Army, Navy, and Air Force Engineers," "Question of an Exclusive Engineering Service Department," "The Federal-Aid Question in the Field of Public Works," and "Problems of Personnel Incentives and Compensation."

Averring that the Interior Department began in the frontier period with the purpose of opening up and promoting new western territory, the report holds that the considerations which from time to time have governed the selection of Secretaries of the Interior by the various Presidents "reflect confusion as to the kind of talent required in the head of the Department which more and more calls for qualifications ordinarily associated with public works."

The report continues: "We do not know the extent, limits, and duration of our most important natural resources measured by modern demands, and we are therefore equally ignorant of the need for development of existing resources or encouragement of substitutes and imports. Certainly some Cabinet official supported by highly expert advisers should speak with familiarity and authority in the Cabinet on this immensely vital subject."

Impounding and Distribution of Water

Stressing the complexities of public projects involving the impounding and distribution of water, the Works Task Force states:

"The question is bound to arise as to which objective is the main one and this, in turn, involves conflict and often compromise between and among the numerous agencies, federal, regional, state, and local, which are called into play."

After recommending unanimously that the Tennessee Valley Authority should be included in the Department of Works as an integral part of the Division of Water Control and Development, and recommending further that the proposed Works Department be manned adequately to offer centralized engineering advice not only in the domestic loan field but also in the field of foreign loans, the Task Force strongly censures "other agencies functioning in the same general sphere" with the Department of the Interior such as Civil Works of the Corps of Engineers, for having "pre-empted parts of the field and clung to their possessions with pleas which are sometimes convincing, but usually only plausible or even specious." In the same tenor, the report continues:

"Some of the current arrangements between engineering agencies and services, including especially the Bureau of Reclamation and the Army Engineers, smack of collusion rather than cooperation, and of neat devices to avoid competition in getting into the Congressional pork barrel.

"The Army Engineers continue to control part of the rivers and harbors and flood control spheres at a time when reclamation in the broad sense, power development, and other phases of engineering work involving rivers and harbors should be part of the same program. To make matters more complicated, this function is shared by other agencies, some of them wholly outside of the Cabinet and, for all practical purposes, beyond the reach and purview of the President himself. It is also a curious fact that a good deal of river and harbor work under the Army Engineers is, if anything, a Navy function with no relation to Army strategy but with some bearing upon navigation.

"The argument that river and harbor work can be directed only by the Army Engineers becomes even more absurd when it is realized that less than two hundred Army Engineers are involved and that the remainder of the personnel under their control, numbering over thirty thousand, are civilians who supply most of the detailed knowledge and continuing direction. If the Army Engineers supply unusual ability and obtain invaluable training by contact with this responsibility, there is no reason why the same and even better results cannot be obtained by assigning them and corresponding officers of the Navy and Air Forces, on a proper, dignified and respected basis, to a central, consolidated Works Department.

"The Secretary of Defense temporarily should assign to the Secretary of Works engineer officers of the Army, Navy, and Air Force who would direct and be engaged in public works tasks commensurate

EXISTING AGENCIES TO BE ABSORBED BY DEPARTMENT OF WORKS

By Division of Planning and Scientific Research

- Bureau of Mines (Interior)
- Geological Survey (Interior)
- Coast and Geodetic Survey (Commerce)
- National Bureau of Standards (Commerce)
- Division of Oil and Gas (Interior)

By Division of Water Control and Development

- Rivers and Harbors (Army)
- Flood Control (Army)
- Panama Canal (Army)
- Bureau of Reclamation (Interior)
- Bonneville Power Administration (Interior)
- Southwestern Power Administration (Interior)
- Division of Power (Interior)
- Tennessee Valley Authority

By Division of Roads, Airports, Parks, and Indian Affairs

- Public Roads Administration (FWA)
- National Park Service (Interior)
- Fish and Wildlife Service (Interior)
- Alaska Railroad (Interior)
- Bureau of Indian Affairs (Interior)

By Division of Housing and Buildings

- Housing and Home Finance Agency
- Public Buildings Administration (FWA)
- Bureau of Community Facilities (FWA)
- Commission of Fine Arts

By Division of Territorial Government

- Division of Territories and Island Possessions (Interior)

ENGINEERING SERVICES TO AGENCIES IN OTHER DEPARTMENTS

- National Advisory Committee for Aeronautics
- Civil Aeronautics Administration (Commerce)*
- Bureau of Prisons (Justice)
- Public Health Service (FSA)
- Veterans Administration
- Coast Guard (Treasury)
- Soil Conservation Service (Agriculture)
- Forest Service (Agriculture)
- Bureau of Land Management (Interior)
- Rural Electrification Administration (Agriculture)
- Reconstruction Finance Corporation
- Export-Import Bank
- District of Columbia
- Atomic Energy Commission

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* Airport construction program to be transferred to Department of Works.

with their rank and experience. In this way, particularly, junior officers would obtain varied training and experience. The Secretary of Defense would continue, as he does now, to prescribe regulations relating to service, rotation of duties and promotion of these engineer officers, with full power to withdraw them from the Department of Works during times of emergency. The Corps of Engineers of the Army would continue in close contact with the best civilian engineering brains in the country to perform functions of a military engineering nature under the Secretary of Defense.

1. DIVISION OF PLANNING AND SCIENTIFIC RESEARCH

Headed by an Assistant Secretary,

Responsible for applied engineering research and report; advance planning of civilian protection, and deferred works

Organization:

- Director of Research
- Director of Planning
- Director of Oil and Gas
- Commissioner of Civil Defense
- Commissioner of Mines
- Commissioner of Geologic and Geodetic Surveys
- Commissioner of Standards

Only the civil functions of the Corps would be transferred to the Works Department under the proposed plan.

"This subject is far too important to be approached from the point of view of old-school-tie tradition. A detached and scientific spirit is required. There have been recent reports of efforts on the part of the Corps of Engineers to preserve the old system and even to reach out for the work of the Bureau of Reclamation. Dams, of course, involve all kinds of considerations—flood control, power development, reclamation, conservation, recreation, navigation, not to speak of federal, regional, and state quasi-public and private financing. It is inconceivable that these and related subjects would be placed in the Department of Defense, which is already a very big institution."

Frankly admitting that there are arguments against a wholly exclusive government service agency, the Task Force recommends that other departments whose engineering needs in the main can be met by the proposed central public works force continue to have "a few engineering advisers of their own to insure proper consideration of their needs and smooth cooperation with the central engineering agency."

Would Unify Construction of Roads and Airports

The report holds that "it is difficult to conceive of a valid argument against a consolidation of public works which will bring together in one agency the officials responsible for federal aid for highways, airports, and housing. These are not operating functions. They involve the distribution of federal money for projects of national significance and the setting of standards which will insure uniformity, and permit taking full advantage of current technical improvements."

Of highways—particularly in the light of increased traffic and cost of highway construction—the report says "the backbone of our new national highway system cannot be made out of toll roads. It will be devised and financed on a joint, cooperative, federal, state, and city basis."

Pointing out that the air transport industry is still in its infancy and in poor financial condition although related to the national defense program, and that specifications and standards for airports need federal aid, the report asserts that the place of airports in the proposed centralized public works organization should be much the same as that of public roads.

2. DIVISION OF WATER CONTROL AND DEVELOPMENT

Headed by an Assistant Secretary,

Responsible for impartial analysis, integrated development, and economical management of water resources

Organization:

- Board of Impartial Analysis consisting of three members appointed by the Secretary
- Chief Engineer of Design and Construction
- Superintendent of Operations

Federal Housing Needs One Set of Experts

While admitting that the housing situation is "an emergency matter which will be alleviated within ten years," the Task Force recommends inclusion of this function in the new Department of Works on the ground that it is "too vital a matter to be kicked around by competing and overlapping executive agencies and congressional committees." The report declares:

"All federal housing activities should be in one division in a Works Department because they require honest analysis by one set of experts who know the building business from the ground up and, as to subsidized dwellings, the precise income groups which require federal emergency help."

In discussing the federal-aid aspects of public projects, the report advocates elimination of competition between federal, state, and municipal governments in the same tax fields, and urges keeping federal aid "within strict bounds" and the making of "only sufficient subventions from the federal treasury to enable the states and their subdivisions to achieve definite purposes of national significance."

The report states also that: "It is obviously silly to be dogmatic about the precise dimensions of the proper federal-aid fields. The whole problem, like that of establishing social equality, is one of evolution. All virtue does not lie in the states, nor all good government and true economy in the grass roots and villages. Grass roots and sidewalk taxpayers may be able to watch carefully and perhaps intelligently the dimes that go into local school taxes, but they are no authorities on atomic research, nor can we safely assume that crossroads wiseacres know all the answers to other international and scientific riddles."

Use of Qualified Consulting Firms Recommended

On the subject of personnel, the report says: "Where engineering activities are concerned, and no matter how the new Department of Works is organized, the traditional tendency to build up a large permanent civil service force in the absence of a foreseeable and continuing need, should be opposed and counteracted. Civil service forces

3. DIVISION OF ROADS, AIRPORTS, PARKS AND INDIAN AFFAIRS

Headed by an Assistant Secretary,

Responsible for standardization and development of integrated national road and airport systems, conservation of parks and natural resources, and progressive management of Indian Affairs

Organization:

- Commissioner of Roads
- Commissioner of Airports
- Commissioner of Parks, Fish, and Wildlife
- Commissioner of Indian Affairs

in many government engineering bureaus invite justified criticism of unnecessary multiplication of permanent personnel and overhead expenses for specific projects which would be better and more cheaply designed and supervised on a consulting fee basis. We need competent top engineers in civil service, but it is only human nature for the rank and file who are paid out of limited project funds to string out the work and make it last as long as possible. Adoption of a policy to retain qualified engineers engaged in private practice for specific purposes on a fee basis would expedite work, reduce overhead costs, afford an opportunity to secure specialized personnel for such specialized work, and would encourage professional pride without weakening the esprit de corps of the permanent civil service personnel.

"Adequate salaries and competent personnel are vital to the proper functioning of any organization. Salaries in the Federal Government, always notoriously low, have not kept up with those in large-scale private enterprise and it is often impossible to obtain the best qualified people to accept or continue in positions of responsibility with the Federal Government. The number of employees in any government department should be kept at a minimum but the best people should be obtained and held by adequate pay and other rewards and inducements. We do not recommend a large technical staff to plan, design, construct, and operate public works. On the contrary, we strongly recommend an adequate staff and the employment of outside consultants for special tasks as they arise. Substantial savings in cost of design and construction will result.

"We should aim at a department with the smallest reasonable number of regular employees. Employees of professional training and rank should be absolutely first-rate people, on a par with the best in private employment, and competent to engage and direct the activities of consultants and contractors in private business. It should be noted that in World War II, military and related establishments more and more adopted the practice of employing outside consultants for specific tasks of limited duration, and got away from the old practice of building up an immense permanent civil service staff for projects performed better, more quickly, and more cheaply by private corporations. Among such corporations should also be included university and other research groups, and laboratories and research units of large corporations, as well as engineering, architectural and other professional firms. The Federal Government will enjoy the up-to-date services of engineers on the latest developments in their particular fields. It will permit the selection of professional firms familiar with the particular problems of the locality, physical difficulties at the site, problems of local building codes and questions of availability of local labor."

Planned Public Works Relieve Unemployment

The report deplores sharply the "spawning of more or less independent alphabetical agencies before and during World War II." Admitting that in preparation for possible war and in the actual conduct of war, "many normally and ordinarily solemn principles of both business and government organization must yield to the common sense, special logic, personalities, pressures and other exigencies of the moment," the report contends:

"The aim should be to reorganize the functions under the President so that they can be operated well at all times, and to avoid the hysterical creation of all sorts of new alphabetical agencies whenever an emergency arises. Whatever world conditions may be, and whether war is remote or threatening, we are entering a highly competitive age in which our world responsibilities are becoming more exacting and pronounced. We are approaching an era in which if we are to avoid totalitarian government we must bring into the Executive Branch the best brains we can muster and provide these brains with the powers, facilities, organization, leeway, and encouragement so that they can function with something approaching the atmosphere of the best and most efficient private enterprise."

In time of peace, both in good times and bad, the functions of a Department of Works would be of inestimable value to the nation's economy, the report avers. The Federal Government's obligations to stimulate employment, promote recovery and prime the pump of private enterprise in times of recession and depression are called "inescapable" in the report, and it is emphasized that it must be assumed that these obligations will "recur from time to time in the economic cycle." Calling for recognition of the fact that advance planning and promotion of public works for periods of recession and depression are "a continued responsibility of the Federal Government working in cooperation with states and municipalities," the report asserts:

"It is senseless to proceed on the theory that every major slump in business and employment is an unexpected Divine visitation not to be anticipated and to be dealt with only on the basis of ineffective, wasteful, and hastily improvised emergency measures. Meanwhile, the depth, dimensions, and duration of a depression can be greatly reduced by intelligent advance planning."

To meet these needs, the Division of Planning in the proposed Department of Works is envisioned by the Task Force as having the responsibility for continuing study of public works projects which truly are "must" projects, even in times of material and labor shortages, and those projects which can be held back until their construction would be an unemployment relief measure in time of depression.

In preparing civilian defense programs and in planning for protection against wartime bombing, evacuation of population and other emergencies, the report points out that "there is need of a single federal agency to plan for and cooperate with local

4. DIVISION OF HOUSING AND BUILDINGS

Headed by an Assistant Secretary,

Responsible for housing surveys, standardization, aid, and underwriting; miscellaneous federal building service, design, construction, and operation

Organization:

Commissioner of Housing
Commissioner of Buildings
Commission of Fine Arts

5. DIVISION OF TERRITORIAL GOVERNMENT

Headed by the Commissioner

Responsible for development of Alaska, Hawaii, and insular possessions

6. DIVISION OF ECONOMY AND RECORDS

Headed by Chief Auditor

Responsible for accounting, personnel, and administrative detail

governments in providing the facilities to meet these emergencies. It is entirely within the realm of possibility that future city planning will have to be guided to some extent as to concentration of strategic industries, plant dispersion, transportation, roads, and location of airports by anticipated war contingencies."

In recommending that the Secretary of Works be added to the membership of the National Security Resources Board to assist in planning and organizing resources essential for the national security, the Task Force recalls "the confusion which resulted during the war in congested war industry areas," and asserts: "The Army and Navy became so disturbed over housing, transportation, sanitary, recreation, and numerous other problems in these congested areas that a special study was made looking toward a single program which would bring under one direction the conflicting efforts of numerous federal, state, local, and other agencies which were attempting to wrestle with these problems. Obviously, if there had been a single Works Department, this department would have been responsible for assisting local officials in the solution of these wartime problems."

Planning and Scientific Research

In its recommendations for the establishment of a Division of Planning and Scientific Research, the report comments that the evils of separation of a research agency such as the Atomic Energy Commission from the President, the Cabinet, Congress, and from the ebb and flow of public opinion "are so great that serious reflection will show that there must be a closer tie with the Executive chosen by the people to govern them, and through the Executive with the other branches of government and the electorate."

Discussing scientific research and reporting, a function which, under the proposed plan, would be performed under the direction of an Assistant Secretary, the report states:

"The functions of the Coast and Geodetic and Geological Surveys and of the Bureaus of Mines and Standards which involve engineering, physical and related observation and research, testing, standardization, and report belong logically in the same Cabinet department and are distinctly works activities. Considering the huge sums which are spent annually on works and developments of a public or quasi-public nature, and the rapid, current technological advances, inventions and discoveries in this field, disproportionately small sums are spent on applied as well as basic research in the interests of both immediate and ultimate efficiency and economy. The establishment of a major research division in a consolidated Department of Works should go far toward remedying this neglect. No doubt some research would continue to be carried on in other divisions of such a department, but most of the efforts in this direction would more and more be concentrated in the Research Division."

Declaring it is inconceivable that all needed employment in bad times can be provided by business, the report admits that public works can take care of only a fraction of the depression employment problem, but calls it an exceedingly important fraction: "It is the marginal area in which men out of work will stew around helplessly unless the government is ready to meet their problems. Few states and municipalities are geared to turn out detailed postwar public works plans and specifications within any reasonable time. There is not a state, city, or municipal subdivision in the country which can, on its own, finance a depression construction program sufficient to make a real dent in the employment problem. Federal assistance is required.

"Idleness and home relief are the worst depression expedients; made work is a shade better; genuine needed, durable, public improvements afford honest, dignified employment and permanent benefits; works which are wholly or partly self-supporting are at the very top of the list. These distinctions are palpable, and smart advance planning always will have them in mind."

Estimates of Needed Public Works

As a measure of the magnitude of needed public works projects, the Task Force cites recent studies showing "that over one-hundred billion dollars will be required to insure reasonably adequate public facilities in the federal, regional, state, and municipal fields," and attributes to one government economist estimates that "the cost of bringing our present highways up to a reasonably workable system would be 30 billion dollars; public buildings, 12 billion; recreational facilities, 7 billion; regional development works, 11 billion; and sanitation, water supply, and similar facilities, 6 billion."

Any realistic analysis of the enormous sums needed "to bring our public works up to date, including consideration of the fact that normal public works activities of the Federal Government now involve two hundred thousand employees and an annual expenditure of three billion dollars," the report asserts, "establishes in our opinion a strong and almost indisputable case for a single consolidated Federal Works Department of Cabinet rank."

Pointing out that under present laws and practices the President "is harassed and overworked, lacks power over agencies in his branch of the Government and cannot command complete loyalty, yet in a considerable measure is held responsible for confusion and waste beyond his control," the report asserts:

"An unfortunate result of the present scattering, independence and irresponsibility of numerous agencies in the executive branch of the government is that these agencies establish their own personal relationships with Congress, and thus drive a wedge between the executive and legislative branches of the government."

Main Aim of Reorganization

"The main purpose of the reorganization of the Executive Branch of our Government, therefore, is to provide a responsible, economical government, with the President as the real instead of the nominal head, and with a rearrangement of departments and personnel such that the President will be free to deal with major problems of all sorts, and will not be burdened unduly with administrative detail. Agencies of government outside of the Cabinet circle, conflicting with established departments and only theoretically reporting to the President, should be brought into proper relation with the major departments headed by the President's Cabinet advisers. It is no doubt too much to expect that Cabinet officers will be selected solely on account of their ability to manage the great departments of government without reference to geography or politics, but it certainly should be possible to make selections within a framework of expert and professional requirements based upon administrative responsibilities."

In order to expedite the reorganization process, pending enactment of specific laws where required, the report proposes "that there be presented to the Congress an interim administrative code providing for the continuance of existing functions and regulations within the framework, intent, and spirit of the new organization."

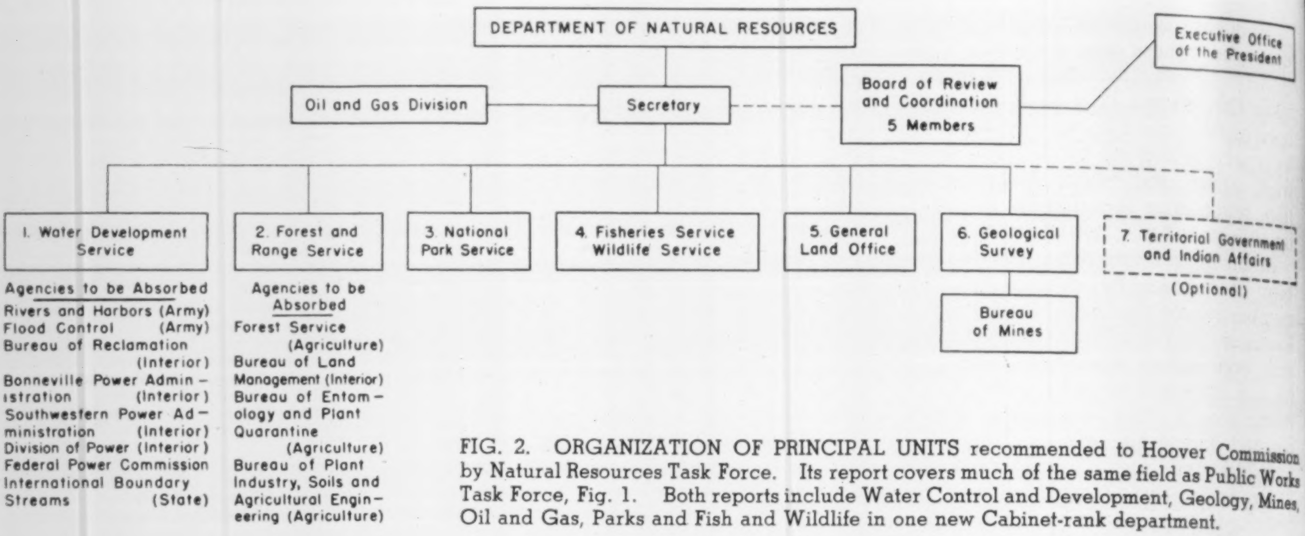
DEPARTMENT OF NATURAL RESOURCES
Executive Office of the President
Board of Review and Coordination
5 Members
Oil and Gas Division
Secretary
1. Water Development Service
2. Forest and Range Service
3. National Park Service
4. Fisheries Service Wildlife Service
5. General Land Office
6. Geological Survey
7. Territorial Government and Indian Affairs
(Optional)
Bureau of Mines
Agencies to be Absorbed
Rivers and Harbors (Army)
Flood Control (Army)
Bureau of Reclamation (Interior)
Bonneville Power Administration (Interior)
Southwestern Power Administration (Interior)
Division of Power (Interior)
Federal Power Commission
International Boundary Streams (State)
Agencies to be Absorbed
Forest Service (Agriculture)
Bureau of Land Management (Interior)
Bureau of Entomology and Plant Quarantine (Agriculture)
Bureau of Plant Industry, Soils and Agricultural Engineering (Agriculture)

FIG. 2. **ORGANIZATION OF PRINCIPAL UNITS** recommended to Hoover Commission by Natural Resources Task Force. Its report covers much of the same field as Public Works Task Force, Fig. 1. Both reports include Water Control and Development, Geology, Mines, Oil and Gas, Parks and Fish and Wildlife in one new Cabinet-rank department.

Reports Compared, Reconciled and Combined

Another task force of the Hoover Commission assigned to report on organization of agencies of government dealing with natural resources, recommended the plan for a Department of Natural Resources shown in Fig. 2.

In many respects there is agreement between the recommendations of the two task forces. The Natural Resources Task Force agrees that the Department of the Interior should be abolished and absorbed into a major division of a new Cabinet-rank department. It agrees that the Rivers and Harbors, and Flood Control functions of the Corps of Engineers should be transferred bodily from Defense to the new department; that there should be an independent board of experts to analyze all major water control and development projects; that National Park, and Fish and Wildlife Services belong in the new department; and that the Bureau of Mines, the Geological Survey, and the Division of Oil and Gas belong there.

Areas of difference exist between the two reports. The Public Works Task Force proposes that Navy and Air Force engineers as well as Army engineers be assigned, by agreement between the Secretary of Defense and the head of the new department, to the new department in all divisions involving engineering, for both supervisory work by senior officers and for training of junior personnel. The Natural Resources report places the independent board of five analysis experts passing upon water and conservation problems in the Executive Office of the President, while the Public Works Task Force recommends a board of impartial analysis of three appointed by the head of the new department. The reports differ in that the Natural Resources group proposes regional advisory committees to give representation to state, local and user interests in connection with water development, and forest and range service. The Public Works group questions the effectiveness of regional committees for coordinating, expediting, or reducing costs of this work.

The major disagreements between the reports are the following: omission from the new department by the Natural Resources group of design, construction, inspection, management, and aid in highway, airport, housing, and buildings, including engineering and scientific services to other departments in research, surveys, and reports; omission of representation on the Atomic Energy Commission by the head of the new department; and the absence of the transfer of the Tennessee Valley Authority to the new department. All these functions and activities are included in the new department recommended in the Public Works report.

"The two reports are not irreconcilable," says the Works Department report. It states that they can be reconciled and combined in a Department of Works and Conservation. But "the creation of three new overlapping and in some respects duplicating departments in place of Interior, one of them right in the White House, seems to us to promise neither efficiency nor economy nor responsibility."

When combined, the Public Works group suggests naming the new department, "Works and Conservation," after including Parks, Fish and Wildlife (Interior) in the Division of Water Control and Development, Fig 1 (2); and renaming it "Division of Natural Resources"; combining Indian Affairs with Territorial Government under an Assistant Secretary instead of a Commissioner in a division of "Territorial Government and Indian Affairs," Fig. 1 (5); and finally, renaming the division, Fig. 1 (3), for the functions remaining in it, namely "Roads and Airports."

It is expected that the full report of the Public Works Task Force will be available from the Government Printing Office early in March.

Public Works Task Force

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Safe Disposal of Radioactive Wastes

RADIOACTIVE WASTES from atomic plants such as Oak Ridge National Laboratory shown above require special disposal techniques. Continuous meteorological observation and monitoring of all effluent liquids are but two of many controls necessary to insure safe discharge of wastes of nuclear fission operations.

Demands Special Training for Sanitary Engineers

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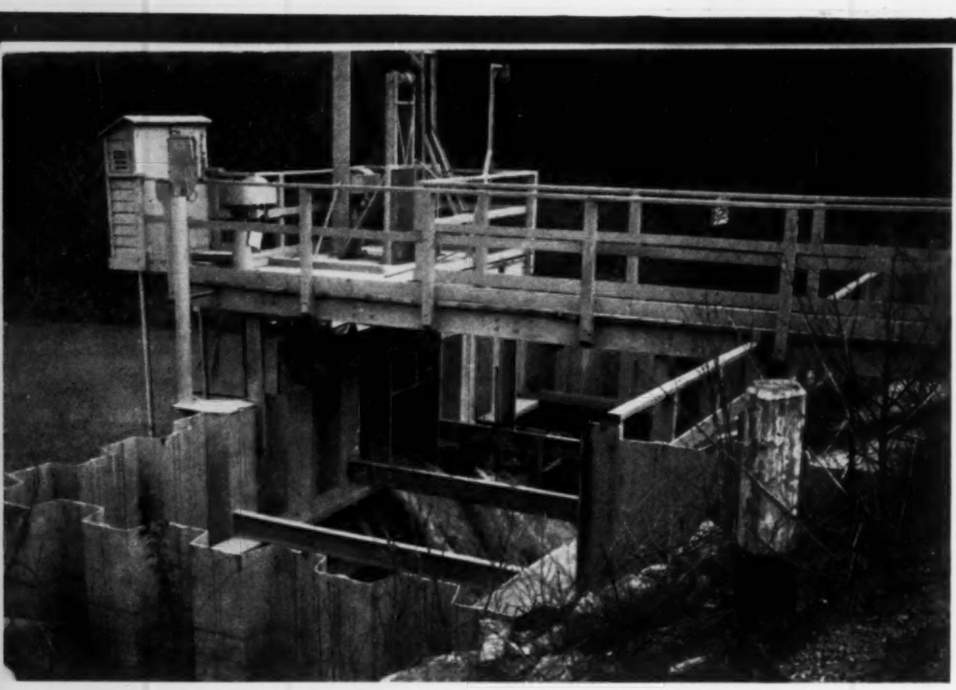
THE ATOMIC ENERGY INDUSTRY, like any other industry, is faced with problems of waste disposal. This is not the first instance in which sanitary engineers have dealt with wastes hazardous to public health, nor are the dangers of radiation strange to science. It is the magnitude of the problem that staggers the imagination. Where previously 30 oz of radioactive matter constituted the extent of our national supply, today we must deal with tons of this material.

In solving these problems the sanitary engineer must familiarize himself with a completely new set of concepts and measures. Such units as the curie—37 billion disintegrations of radioactive atoms per second—and the roentgen—83.8 ergs absorbed by one gram of dry air—are but two of these. In atomic energy plants all waste must be carefully monitored before it can be discharged. There is a wide disparity between decontaminating methods for different radioactive materials. Some particles decay—lose their radioactivity—in a few minutes; others take centuries and therefore must be encased in radiation-resisting containers and buried. In some of the plants now in operation, where radioactive gases are being discharged, operations can only be carried on when meteorological conditions are satisfactory for diffusion in the atmosphere and consequently continuous weather observations must be maintained. Mr. Gorman herein gives answers to some of the problems of waste disposal encountered by the Atomic Energy Commission. His original paper was presented before the Sanitary Engineering Division at the ASCE Annual Meeting in New York.

MANY OF the sanitary engineering problems which face the atomic energy industry parallel those of other industries, but because of the different properties of the product and its wastes, there are complexities entirely new to the sanitary engineer. In order to develop a background against which to discuss some of the more important sanitary engineering problems related to nuclear fission, a brief description of operations carried out in research and production in the atomic energy industry is desirable.

In the preparation of raw materials, radioactive ores are crushed and sieved to size prior to chemical treatment for refinement and subsequent processing for use in piles or nuclear reactors. In these physical, chemical, and metallurgical operations, solutions, dusts, fumes, mists, and particles appear. As in other industries, care must be taken to safeguard employees and persons living in the immediate neighborhood from these harmful elements by preventing contamination of working areas, the air, the soil, nearby sewers, and watercourses. The same is true of non-radioactive, but toxic, materials such as beryllium and fluorides. This can be done by "bottling up" gaseous and liquid wastes in closed systems, by decontaminating off-gases and dusts as near as possible



WATER CONTAMINATED by radioactive wastes is held in concrete basins and ponds and monitored continuously. Shed contains instruments for monitoring. Liquid wastes may be retained in ponds such as one shown until radioactive material has decayed (lost its radioactivity) sufficiently to be discharged into natural waterways, or it may be buried in lead and concrete containers when decay periods are extremely long.

to the source of their origin, and by effective ventilation of working areas, with terminal decontamination of all gaseous effluents before release to the atmosphere. In removing atmospheric contaminants, such facilities as scrubbers, cyclones, electrostatic precipitators, and filters—fibrous and granular—are used.

The refined and packaged uranium or other chemical to be treated by nuclear fission is placed in piles or reactors where it is subject to bombardment by neutrons. In these atom-smashing machines the desired isotope, new element, or other fission products are produced. Enormous amounts of heat are generated in this production. This heat has great possibilities for performing useful work but it must be carried away quickly or it will result in serious damage to the pile structure. In a typical production area such as at the Hanford Works in the State of Washington, the piles are water cooled and use as much water in a day as the average city of over one million people. At the Oak Ridge Pile in the X-10 area the pile is air cooled, as will be the new pile under construction at Brookhaven on Long Island, some 60 miles from New York. The volume of air required in these units is enormous.

Characteristics of Radioactivity

After exposure to neutron bombardment, the uranium slugs containing fission products become highly radioactive. They now give off radioactivity in the form of penetrating gamma rays and alpha and beta particles which are damaging to living tissues, the seriousness of the damage depending on whether they are absorbed by surface exposure or enter the body through a break in the skin or by inhalation. Radioactive materials vary in the type and character of energy they emit and they lose energy through decay. The rate at which this decay takes place may be demonstrated by the fact that a milligram of radium gives off 37 million disintegrations per second. The rate of radioactive decay of a radioisotope is expressed in terms of the time required for it to lose one half of its initial energy (Table I). For example, the isotope iodine (I^{131}) has a half life of 8.3 days. In that time it will lose one half of its original radio energy; one half of the remainder will be lost in another 8.3 days and so on to complete decay. An approximation of the time required for complete decay may be made by multiplying the half life by six. Decay curves for most radioactive substances have been determined with accuracy. The sanitary engineer in dealing with radioactivity must take into consideration these time factors just as he must consider the time factor in runoff, stream flow, biochemical changes and the incubation period for various diseases.

The cooling water or air used in the operation of an atomic pile presents problems of special interest to the sanitary engineer. Substances in suspension or solution in the "coolant" become radioactive in passing through the pile. This means that consideration must be given to the quality of water or air prior to use.

When water is used to cool a nuclear reactor, substances in solution or suspension, which have long half lives, must be removed, or the effect of this radiation must be provided against in the disposal of the "coolant." The current practice is to hold the cooling water long enough to permit substantial decay of the radiation energy so that the water may be safely disposed of by discharge and dilution into a nearby waterway.

When air is used in cooling nuclear reactors, it must be free from contaminating dust and chemical fumes or they will become radioactive and introduce complications in the disposal of the waste gases. The cooling air discharged from a reactor should be filtered through roughing and final filters before being discharged to the atmosphere. Research to determine the best filter materials to decontaminate air used for cooling piles and ventilating operating areas of production and research is now being carried out.

Radioactive argon, having a half life of 110 minutes, is the principal contaminant of clear air used to cool a pile. If meteorological conditions are favorable and discharge of the waste gases is through high stacks and at velocities sufficiently high to give good diffusion in the atmosphere, disposal by dilution can be carried out satisfactorily. The Atomic Energy Commission has enlisted the cooperation of the Weather Bureau in studying the meteorological aspects

MACHINE CHECKS hands and feet of workman simultaneously for contamination. Equipment which could be re-used may have to be stored because of its radioactivity until sufficient decay period has transpired. Radioactive clothing may be decontaminated by scrubbing or it may have to be buried. Combustible material cannot be burned as gases of combustion would be radioactive.

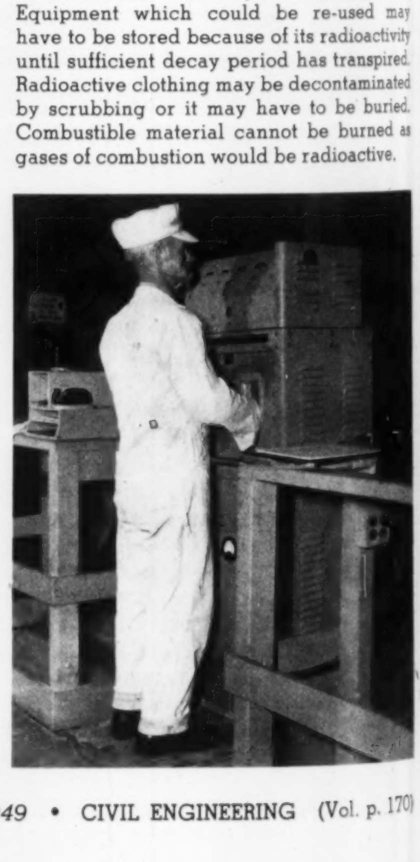


TABLE I. CHARACTERISTICS OF FOUR TYPICAL RADIOACTIVE ELEMENTS

Element	Symbol	Atom Number	Mass No. of Isotope	Half Life	Type of Radiation
Phosphorus	P	15	32	14.3 days	Beta–
Iodine	I	53	131	8.3 days	Beta–, Gamma
Carbon	C	6	14	5,000 years	Beta–
Sodium	Na	11	24	14.8 hours	Beta–, Gamma

of its operations, and in most of the operating and research areas modern equipment has been installed to give the necessary meteorological data.

Operations at the Brookhaven National Laboratory will be governed by meteorological forecasts very carefully prepared from extensive observations. Should atmospheric conditions be unfavorable or radioactive contamination be recorded at atmospheric monitoring stations in the vicinity, operation of the reactor will be moderated or stopped.

After the irradiation material, such as uranium, is removed from the pile it is treated chemically to separate the product desired from its fission products. Before the separation processes begin, however, the "hot" (highly radioactive) slugs are permitted to cool in order to exhaust most of the short-lived radioactivity. Because of the high level of radioactivity the materials and waste products resulting from separations and purification processes are handled by remote control. Workers are shielded by thick walls of cement or lead or both. Operations which result in loss of fumes, mists, or particles are carried out in ventilated spaces to prevent contamination of the air in the building. As in other industries, it has been found that air should be treated near its point of origin. Dissolver off-gases are scrubbed and filtered. Ventilating air from chemical separation buildings, and cells housing specific equipment are filtered usually one or more times by fibrous or granular filter media.

FILM METER on lapel and ion chambers in breast pocket are standard equipment for atomic-energy-plant personnel. Small meters (on finger and wrist) may be worn on parts of body especially subject to radiation. Permissible duration and intensity of exposure are factors with which sanitary engineers must familiarize themselves.

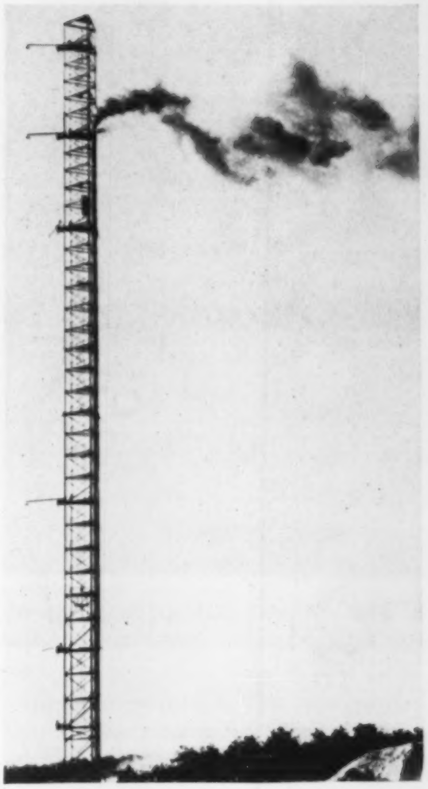
Disposal of Wastes

In the disposal of radioactive liquid wastes, it has been found that where soil conditions are favorable, some wastes from chemical operations can be disposed of by underground cribbing and others by lagooning and evaporation. Fortunately, most radioactive contaminants readily attach themselves to certain soils and are thereby held near the point of discharge. Currently the U.S. Geological Survey is cooperating with the AEC in a research program to appraise the effectiveness of underground disposal methods in various areas.

It is the policy of the Commission to reduce radioactive liquid wastes to the smallest volume possible and ultimately to reclaim as much radioactive material as it can. Large volumes of highly radioactive liquid wastes having economic value are being stored in steel and concrete tanks under and above ground for future reclamation.

Gaseous wastes discharged from stacks at chemical separation plants are a potential source of contamination to the ground and vegetation in the immediate area of the stacks. And it has been found that radioactive particles in the gaseous effluents from chemical separation plants in the atomic energy industry can be carried long distances. Facilities for decontaminating these wastes must be installed. As in the case of air-cooled piles, operations are subject to meteorological conditions and are suspended when these are unfavorable.

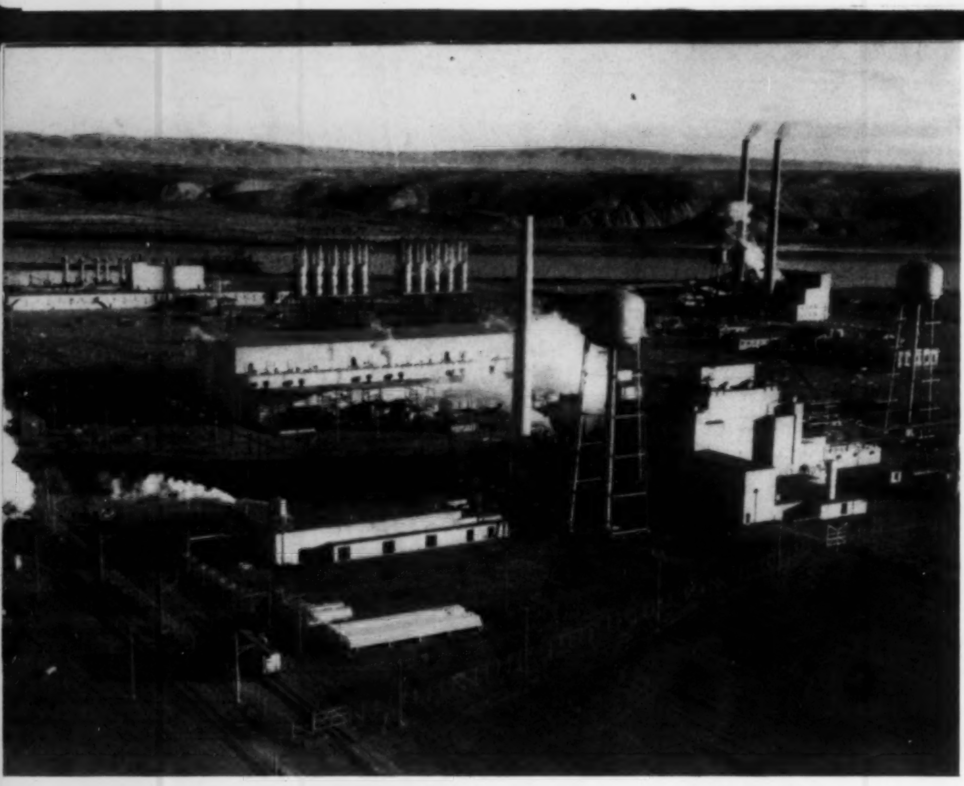
Late in May 1948 a Working Group on Stack Gas Problems was organized under the chairmanship of Dr. Abel Wolman, M. ASCE, Professor of Sanitary Engineering, Johns Hopkins University. This group consists of seven experts in the field of industrial hygiene, and besides advising area representatives on their various problems it is supervising special research work on the problems of decontaminating gaseous effluents from atomic energy operations.



HARMLESS OIL FOG SMOKE from 420-ft weather tower at Brookhaven National Laboratory provides valuable data on behavior of gaseous wastes. These data, correlated with detailed weather information, are necessary for efficient operation of Brookhaven's nuclear reactor and for safeguarding surrounding countryside from radioactive gases.

Radioactive solid wastes which are recoverable, such as uranium dusts and chips, are reclaimed. Miscellaneous rubbish such as used waste paper, glassware and dead animals used in experimentation are buried. In some areas they are encased in concrete before burial for shielding. Combustible material which in other industries would be disposed of by burning must be buried when it is radioactive. The reason for this is that the gases of combustion would also be radioactive. Special research is now being carried out to develop more effective incinerators for use in various areas of research and operation with complete facilities for decontamination of gases.

Equipment which becomes contaminated is cleaned with acids and detergents and when too contaminated to use with safety is stored in a restricted area or is buried with ade-



ATOMIC ENERGY COMMISSION'S Hanford Works in southwestern Washington covers area of 631 sq miles. One of main production units appears in view.

quate cover for shielding. Wearing apparel such as gowns and hoods which are worn in areas or laboratories as a precaution against radioactive contamination are sent to the laundry for washing with special detergents and decontaminating substances and are monitored for radioactivity before re-use. In some production areas, machinery, equipment, and building material which, but for their radioactivity would be satisfactory for continued use or resale for salvage, must be kept in restricted storage until an adequate decay period has transpired.

COMPLETELY SWATHED in protective clothing, health physics inspector measures radiation intensity with fish-pole meter at Oak Ridge, Tenn., plant.

Isotopes Distributed to Hospitals

Among the important products of the atomic energy industry are the isotopes being distributed to hospitals, universities, and other institutions, public and private, for research in medicine, biology, agriculture, metallurgy, and many other fields of science. The Commission is shipping these isotopes to institutions in a large number of the states and to a number of foreign countries. Care is exercised to prevent loss or exposure to radiation by shipping in tight, shielded containers. The level of radioactivity and the amounts of these isotopes used are relatively low but the number of shipments has increased in the last two years from a few hundred per year to several thousand, and the demand continues. Users are instructed in the safe handling and disposal of these radioactive materials, but obviously this does not preclude the possibility of accidents or spills, and the consequent discharge of radioactive wastes into public sewer systems. There is much interest in the effect such radioactive wastes will have on traps, pipes, and other drainage facilities in buildings and on public sewer systems; also in the effect of radioactivity on the biological processes of sewage treatment and on the ultimate disposal of the effluents and sludges.

Research in these sanitary problems is now being conducted by the AEC in cooperation with the Public Health Service at the Oak Ridge National Laboratory and at Los Alamos as well as under contracts with the Sanitary Engineering Department at the Johns Hopkins and New York Universities.

Sanitary engineers are accustomed to appraising problems of water supply, waste disposal and environmental sanitation in terms of permissible limits of contamination based on findings developed by well standardized methods of procedure and instrumentation. In the atomic energy industry such ideal conditions do not exist at this time, and much research must be carried out and experience gained before this will be possible. Present standards for permissible safe exposure of human beings to radioactivity are based on experience with X-rays and in the radium industry.

For purposes of monitoring air and water containing contaminants, the health physicist has translated these standards into a unit which he can detect through Geiger-Muller counters. This unit is the microcurie, which is a total of 37,000 disintegrations per second.

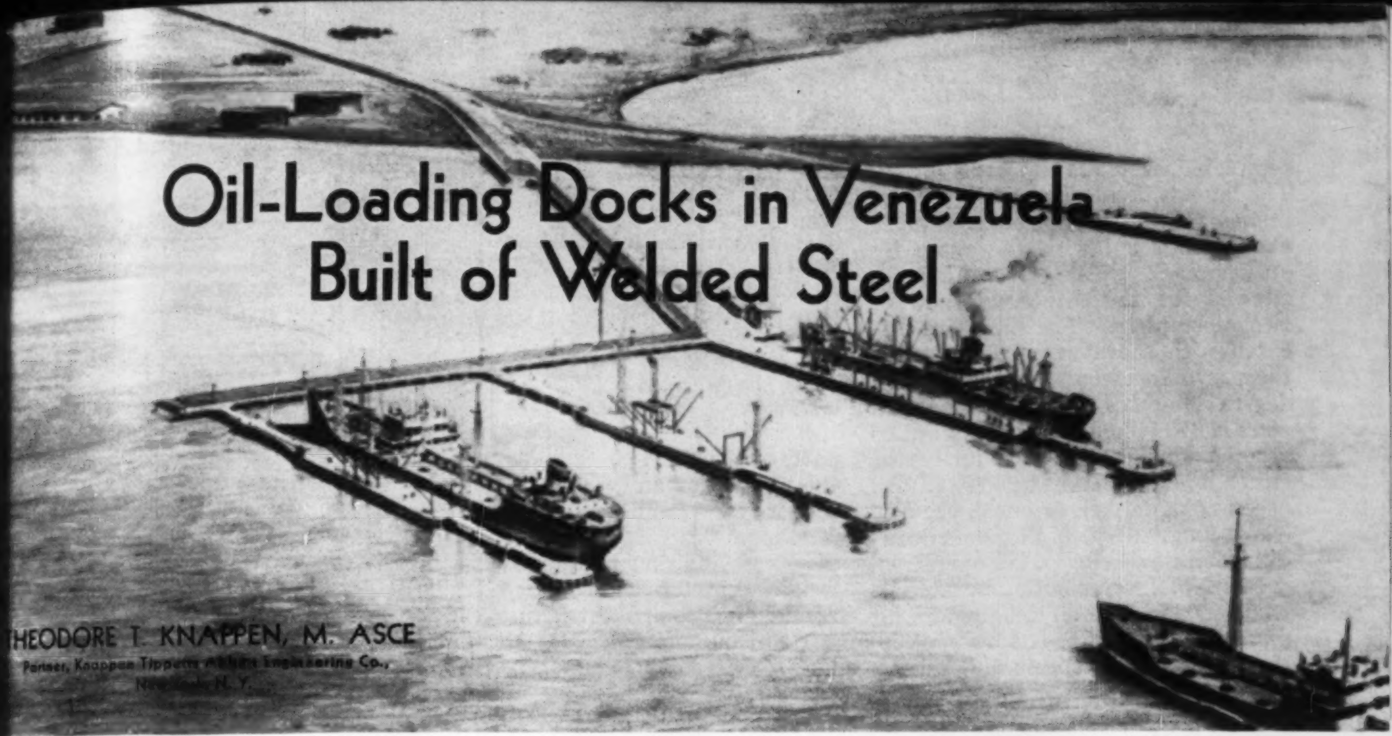
Tentative maximum permissible limits of contamination of air and water have been established but are subject to change. Limits published in the AEC regulation "Standard Safety Requirement" of April 1947 are as given in Table II.

TABLE II. PERMISSIBLE MAXIMUM LIMITS OF CONTAMINATION IN AIR AND WATER

	Type of Radiation Emitted	Microcuries per cc
Air	Alpha (Plutonium)	3×10^{-11}*
	Beta, Gamma	10^{-7}
Water	Beta, Gamma	5×10^{-4}

* For 8-hour working day, 6 days per week for one year. Objective is to prevent disposition of a total of more than 1.0 micrograms of plutonium in the body during a person's lifetime.

The need for trained sanitary engineers in nuclear physics and for alerting sanitary engineers in general to some of the problems of the atomic energy industry in the area of their specialty is obvious. At the present time there is a limited number—probably less than ten—of sanitary engineers on the staff of the AEC and its contractors. In addition, six sanitary engineers or sanitary chemists of the Public Health Service are being given training in nuclear physics either at Oak Ridge or Los Alamos in connection with research activities. There is need for a much wider training program and this is under consideration.



Oil-Loading Docks in Venezuela Built of Welded Steel

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New York, N.Y.

Pipeline Terminal at Amuay Bay Provides Facilities for Ocean-Going Tankers

TO TRANSPORT OIL from Lake Maracaibo, the Creole Petroleum Corp. of Venezuela has built a 145-mile pipeline to its refinery and loading piers for ocean-going tankers at Amuay Bay on the Paraguaná Peninsula. Mr. Knappen's firm designed and engineered the construction of the deepwater harbor, complete with all-welded steel piers for berthing and loading 26,000-ton tankers. Double I or WF beams 100 ft long, connected by cover plates, were driven to penetrate 30 ft into hard material without jetting. Corrosion protection of the steel consists of bitumastic coatings; concrete jackets on piles in the "between wind and water" region; and, probably for the first time, cathodic protection using galvanic anodes. This pier and harbor improvement program required 4,800,000 cu yd of dredging and 10,000 tons of structural steel.

CRUDE OIL from Lake Maracaibo, Venezuela, was formerly handled by the Creole Petroleum Corp. by shipping in lake tankers about 200 miles to the island of Aruba, Dutch West Indies, where it was either refined or transshipped in ocean tankers (Fig. 1). Transfer to ocean-going tankers was necessary because the depth over the bar at the entrance to Lake Maracaibo is maintained by dredging at about 18 ft whereas most ocean tankers draw 30 ft or more.

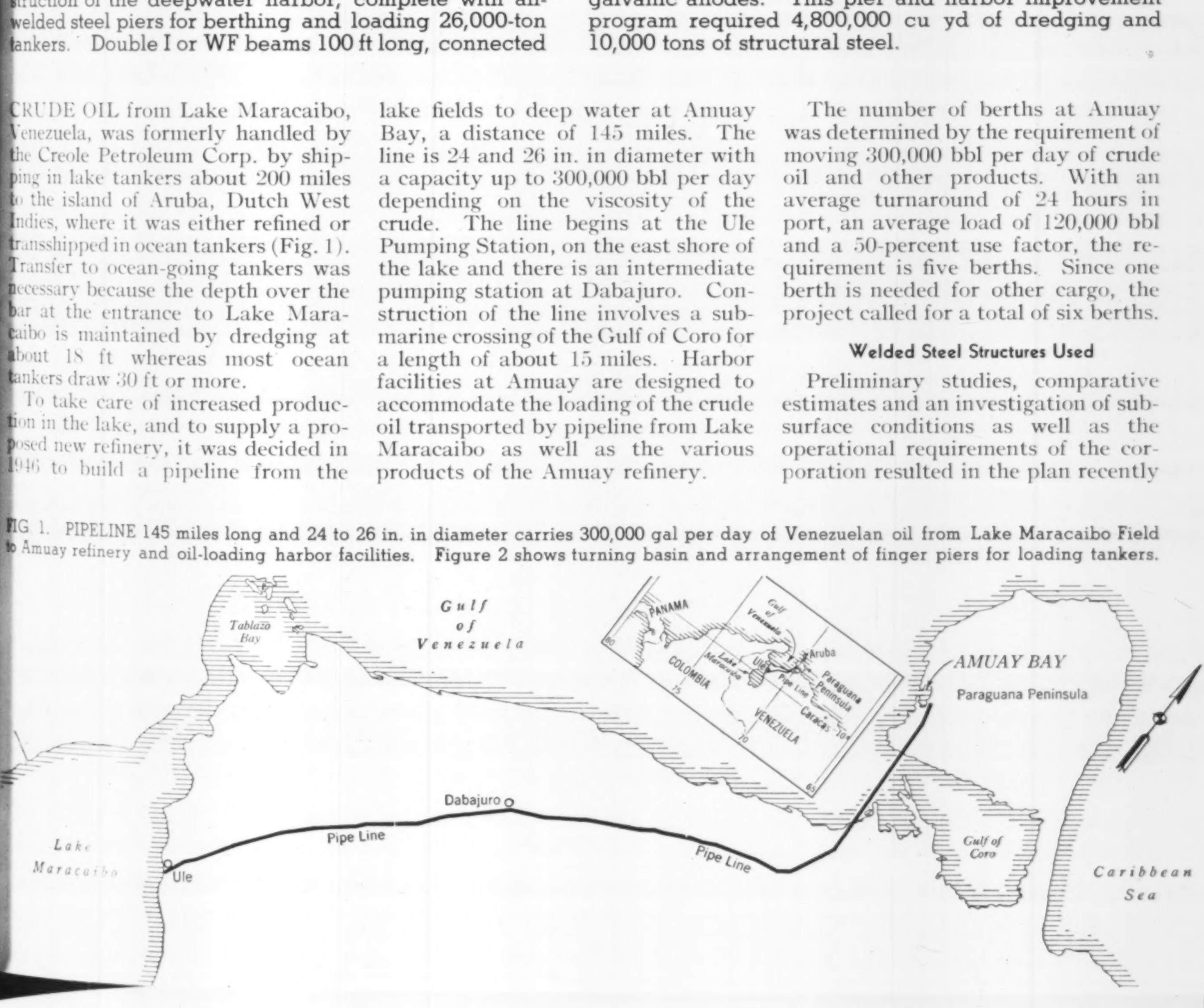
To take care of increased production in the lake, and to supply a proposed new refinery, it was decided in 1946 to build a pipeline from the lake fields to deep water at Amuay Bay, a distance of 145 miles. The line is 24 and 26 in. in diameter with a capacity up to 300,000 bbl per day depending on the viscosity of the crude. The line begins at the Ule Pumping Station, on the east shore of the lake and there is an intermediate pumping station at Dabajuro. Construction of the line involves a submarine crossing of the Gulf of Coro for a length of about 15 miles. Harbor facilities at Amuay are designed to accommodate the loading of the crude oil transported by pipeline from Lake Maracaibo as well as the various products of the Amuay refinery.

The number of berths at Amuay was determined by the requirement of moving 300,000 bbl per day of crude oil and other products. With an average turnaround of 24 hours in port, an average load of 120,000 bbl and a 50-percent use factor, the requirement is five berths. Since one berth is needed for other cargo, the project called for a total of six berths.

Welded Steel Structures Used

Preliminary studies, comparative estimates and an investigation of subsurface conditions as well as the operational requirements of the corporation resulted in the plan recently

FIG 1. PIPELINE 145 miles long and 24 to 26 in. in diameter carries 300,000 gal per day of Venezuelan oil from Lake Maracaibo Field to Amuay refinery and oil-loading harbor facilities. Figure 2 shows turning basin and arrangement of finger piers for loading tankers.



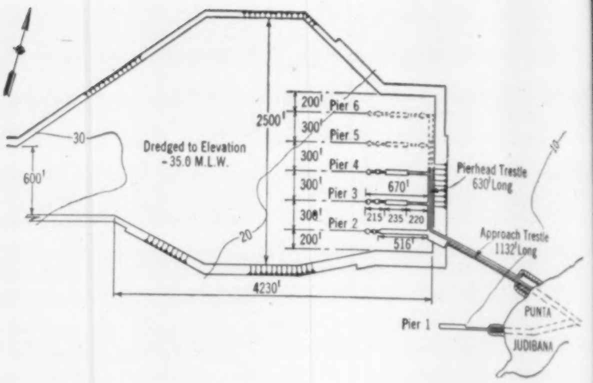


FIG. 2. OCEAN-GOING TANKERS enter 2,500-ft-wide turning basin through 600-ft ship channel to berth at three finger piers. All ship channels are dredged to 35 ft, plus 2-ft overdepth, below mean low water.

completed, which is shown in Fig. 2. The layout, besides providing for the immediate construction of three finger piers, connected with the shore by an approach trestle 1,132 ft long, allowed for the future addition of two more piers. The piers are oriented with the average direction of the prevailing winds, which is N 73 deg E. Each of the three completed piers is 670 ft long and is designed to accommodate at each of its berths either a 400-ft lake tanker, a T-2 ocean-going tanker, or one of the new 628-ft-long, 26,000-ton tankers drawing 32 ft, now being put in operation.

Pier No. 2 serves both for materials transfer and for oil loading. This pier consists of a 516-ft section of 50-ft width, and a mooring and a turning dolphin connected to each other and to the main pier section by trestles. The 50-ft-wide section is equipped with an electrically operated Model R-25 American Revolver gantry crane, having a main hook capacity of 30 tons at a 75-ft radius and a whip hook capacity of 5 tons at all radii up to 105 ft Piers Nos. 3 and 4 serve only as crude and product loading piers. Each pier consists of a 235-ft loading platform 40 ft wide, two mooring dolphins, a turning dolphin, and connecting trestles. The docking ships breast and moor on both sides of the piers at the loading platforms.

The three finger piers and the trestles are all-welded structures, with the exception of the steel piles, which were delivered by the manufacturer with the cover plates riveted to the I-beams. The bents of the piers were designed as rigid frames with very few sections requiring brace or batter piles. The use of welding to connect the component parts of the structures provides an economical and functional type of pier. In addition to the savings in weight of material, the welded details resulted in a compact structure, which left a maximum space for the pipelines. Large piles cannot be driven accurately to line—some misalignment is unavoidable. In riveted construction misalignment is a serious matter requiring fitting of the riveted connections in the field. For the all-welded construction, a practicable adjustable detail was developed. About 10,000 tons of steel was required for the construction of the structures.

An all-welded spring-fender system for absorbing the impact forces of the ships during docking protects the 50-ft-wide section of the materials pier, the loading platforms of piers Nos. 3 and 4, and the turning dolphins. The springs used are of 30- and 50-ton impact absorbing capacity.

A timber materials dock, pier No. 1, was constructed prior to the construction of the steel finger piers and trestles to serve as an unloading platform for the materials delivered for the construction of the piers, pipelines and refinery. The dock is 300 ft long and 40 ft wide. It is connected with the shore by 300 ft of 20-ft-wide trestle and 150 ft of fill. Pier No. 1 serves also as a permanent barge and small-boat dock.

Piers Designed for Wind and Ship Impact

The structural characteristics of the piers were determined by their main function, which is to support pipelines and live loads on piers and to provide for berthing of ships. The approach trestle was designed for the alternate live loads of 300 lb per sq ft of paved area, an H-20 highway loading; and a 66-ton tractor-dolly combination, used in transporting large pipe sections. The pierhead trestle was designed for the alternate live loads of 300 lb per sq ft, and an H-10 highway loading. For Pier No. 2, the design live load consists of several combinations of a uniform load of 500 lb per sq ft; maximum wheel loads due to a loaded 30-ton gantry crane; H-20 highway loading; and a 66-ton tractor-dolly combination. On piers Nos. 3 and 4, a uniform live load of 500 lb per sq ft was used for the loading platform and 300 lb per sq ft on the areas of the dolphin platforms.

Consideration was given to the forces resulting from thermal expansion and creep of the pipelines, and to the hydrodynamic forces of flow of oil and water, acting at the bends of the pipe and at the anchor points. At the mooring points, the structures were designed for the longitudinal components of the wind loads on the ships moored. In general a wind load of 20 lb per sq ft, corresponding to a 70-mile-per-hr wind velocity, was assumed to act on the exposed silhouette of the structures and the moored ships.

As a criterion for ship impact, a fully loaded tanker (34,000-ton displacement) was assumed to approach the pier at a velocity having a transverse component of 16 ft per min, and deliver a broadside blow compressing the spring fender 12 in. and deflecting the structure 1 in. Neglecting energy losses due to water resistance and non-elastic crushing of timber, it was assumed that the entire kinetic energy

APPROACH TRESTLE to piers carries roadway and three tiers of pipelines, and provides space for future installations. Buildings house customs offices, first-aid room, transformer and switching gear, and other pier service facilities.

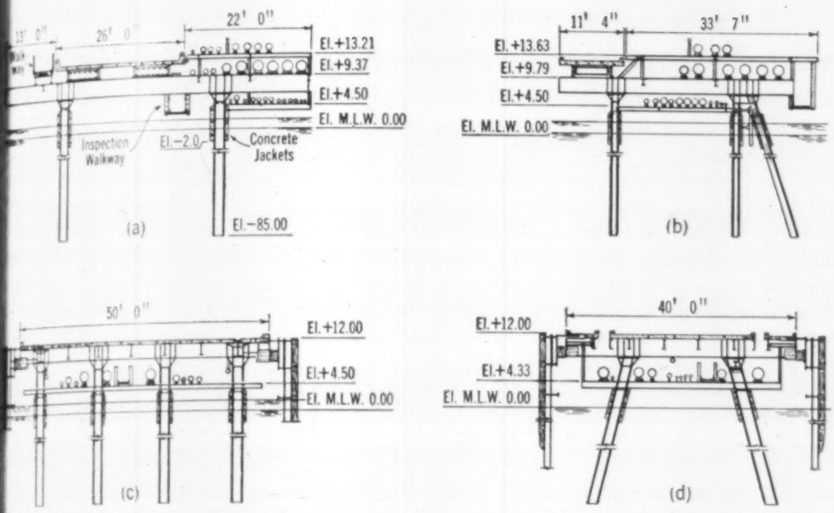


FIG. 3. TYPICAL SECTIONS indicate design of all-welded steel piers to carry 35 pipelines for petroleum products, ballast and service lines: (a) Approach trestle, (b) pierhead trestle, (c) finger pier No. 2, (d) finger piers Nos. 3 and 4. Spring-fender system protects piers and turning dolphins.

of the ship is transformed into the work of deflecting the structure, and that the following relationship holds,

$$\frac{Wv^2}{2g} = Pd$$

where P is the average force exerted on the structure and d is the total deflection. The maximum force was assumed to be twice the average force.

The above criterion resulted in an impact force of 150 kips applied to the fenders of pier No. 2 and to the loading platforms of piers Nos. 3 and 4. For the turning dolphins, which are exposed to greater navigational hazards, the above force was increased by 50 percent.

Although the piers appear low when viewed above the water surface, they are in reality tall structures, with the bottom of the piles 85 ft below mean low water and the top of the piers 12 to 14 ft above. A feature of this type of structure is that considerable deflection is permissible and even desirable. Flexibility of the structure serves to reduce the impact forces due to a blow from a ship and, together with the spring-fender action, protects both the structure and the ship. On the other hand, flexibility must be compatible with the requirements of the pipelines and their permissible safe deflections.

Either steel or reinforced concrete is feasible for most parts of this structure. However, precast reinforced concrete piles would be excessive in size and weight, especially those for the loading platforms and turning dolphins. For the conditions at Amuay Bay, it was economical to reduce the number of piles to a minimum, even if it led to an increase in the size of the piles; to avoid the use of batter piles wherever deflections permitted; and to achieve lateral strength by rigid-frame action.

The design assumes that the silt which extends from harbor bottom at El. −37 to about −52 provides no lateral support for the piles. The unsupported lengths of the piles are so great that the available rolled H-piles were found to be either too slender or too heavy and wasteful of material. A box-type pile was therefore evolved, consisting of two I or WF beams welded together longitudinally, or riveted together with two steel cover plates. The piles vary from 92 to 100 ft in length, and the weight varies from 8.7 to 14.5 tons per pile.

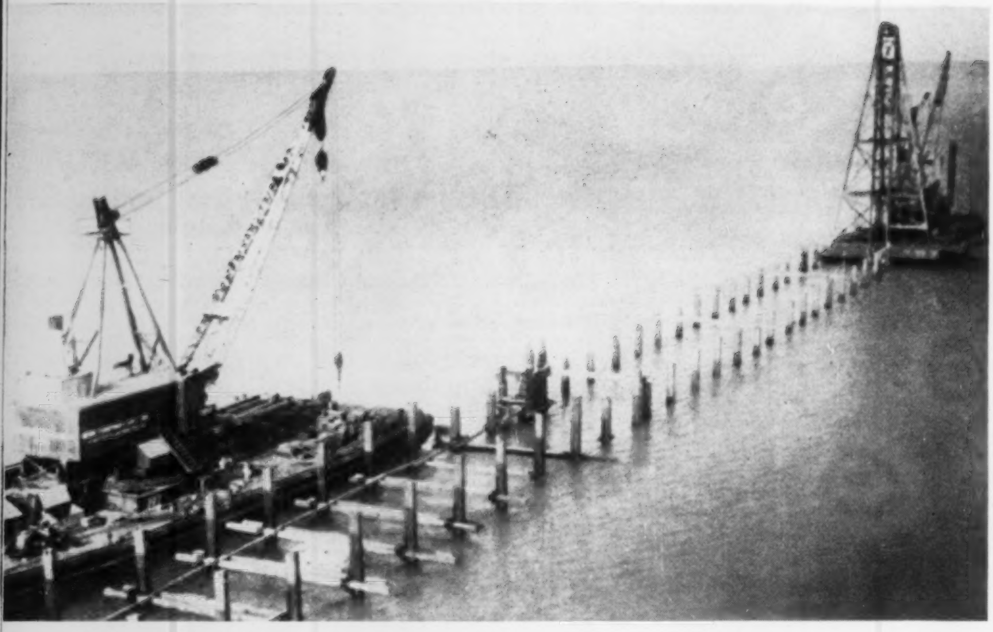
The piles, capped and rigidly connected to the transverse beams, form the rigid-frame bents. Typical sections are seen in Fig. 3. In the approach trestle the bent consists of two vertical piles, each built up of two 20 I 65.4-lb beams with two $17 \times \frac{1}{2}$-in. cover plates and a 36 WF 170-lb cap beam. In pier No. 2, the bent consists of four vertical piles, each built up of two 21 WF 73-lb beams with $19 \times \frac{1}{2}$-in. cover plates, and a 30 WF 116-lb cap beam. In both cases, the combinations of vertical live loads with the lateral loading were satisfied by the strength developed in the rigid-frame action of the bents. The deflection of pier No. 2 under maximum wind load on two moored ships was computed at $3\frac{1}{2}$ in., which is within the permissible deflection of 4 in. for the safe functioning of the pipelines.

For the loading platforms of piers Nos. 3 and 4, it was found impossible to satisfy both the strength and specified minimum deflections by the use of vertical leg bents. An inclined leg bent was therefore used, with each pile consisting of two 24 I 79.9-lb beams with two $18 \times \frac{1}{2}$-in. cover plates.

Combinations of vertical and inclined bents were dictated in the case of the mooring and turning dolphins of the piers. Pipelines on the pierhead trestle, which are T-connected to the lines on the finger piers, limited the permissible deflection to 1 in. This part of the structure is normally not subject to ship impact but requires batter piles as bracing against excessive movement.

To take care of the thermal expansion of the long structure, the trestles are broken up into blocks of about 300-ft lengths, separated by expansion joints. Each block is held fixed at its midpoint by a pair of brace piles. Additional brace piles take care of the reactions from the pipeline anchorages. For continuity and alignment the expansion joints are provided with shear keys which also transfer transverse loads from one block to the adjacent ones.

TANKER TIES UP at pier No. 2, while construction proceeds on mooring dolphin in foreground. Approach trestle connects with Maracaibo pipeline and Amuay refinery. Floating rig on left drives steel piles for pier No. 3.



PILES FOR APPROACH TRESTLE are driven by floating pile driver (right) while bracing is placed by crane on barge.

For the steelwork, the American Institute of Steel Construction code was used with a basic working stress of 20,000 psi. For loading conditions combined with maximum wind load, the allowable stress was increased by 33 percent. For areas of maximum corrosion, "between wind and water," extra thickness of metal was provided by reducing the allowable stress by 15 percent. In the reinforced concrete work, 3,000-lb concrete was used with air-entrained cement, with working stresses following the American Concrete Institute code.

Double I-Beam Piles Support Piers

Subsurface conditions at the site of the terminal facilities were investigated by a program of 35 dry sample borings, in 10 of which 2-in.-dia thin-wall-tube samples of silt were taken. The harbor bottom slopes gently from the Punta Judibana shoreline outward toward the center of the bay. At the location of the finger piers and pierhead trestle, the original depth to harbor bottom was 12 to 15 ft below mean low water. After dredging, this depth was increased to about 37 ft. The entire bay bottom is underlaid by a stratum of soft organic clayey silt containing some shells and peat. Beyond 400 ft offshore, the silt extends generally to a depth of 52 ft below mean low water, giving an original thickness of this stratum of 35 to 40 ft. Below the silt, a 5-ft layer of silt, sand and clay generally occurs. Below El. −57.0 lie mixed layers of hard clay and dense sand. The upper 3 to 5 ft of this stratum is partially cemented and may be classified as hardpan.

Laboratory tests on samples of silt indicated that at 25 ft below harbor bottom the unconfined compressive strength is 160 to 400 lb per sq ft.

Design of foundations for the terminal facilities required consideration of the following items: Dredged-area side slopes; penetration of piles required to develop design bearing and tensile capacity; penetration of piles to develop fixity; and procedure for driving piles. Side slopes of the dredged area were determined by using D. W. Taylor's stability number chart, taking into consideration the depth to which the silt stratum extends below the depth of dredging. A stepped side-slope with an average slope of 1 on 6 was chosen. Stability analysis showed that steps with practically vertical 7-ft rises could be used. This design was found consistent with the operation of the dredge and was accordingly followed.

At the time of design it was thought that it might not be possible to obtain by driving alone the 30-ft penetration into the hard material required for fixity of the piles. Fortunately the contractor was able to use an S-14 McKiernan-Terry single-acting hammer, which has a 14,000-lb ram and delivers 37,500 ft-lb of energy per blow. Driving was easier than anticipated. Two to five blows per inch of penetration were required, and jetting was unnecessary. Piles used are larger than any for which data are available for bearing, tensile capacity, or fixity. Design assumptions and test results are summarized in Table I.

The approach trestle is designed to carry 35 pipelines for distribution of the crude oil and various products to the loading platforms of the piers. For present requirements, 22 lines were installed, of which four are 24-in. crude loading lines, one is a 24-in. ballast line and the others are various product and service lines, varying from 4 to 20 in. in diameter. Each pier is provided with two 24-in. loading lines, a ballast line and certain product and service lines. Pier No. 4 carries the gasoline product lines. The lines are located below the concrete deck of the loading platforms. At the loading or bunkering points laterals are brought through openings above the deck. Elevated derrick platforms located at bunkering points on the loading platform of piers Nos. 3 and 4, support 40-ft booms for handling the hoses. The derricks are powered by air-operated winches. On pier No. 2, where derrick platforms could not be used since they would interfere with the travel of the crane, detachable monorail structures have been installed on the edge of the pier for handling hose lines.

All-Welded Steel Pipelines Used

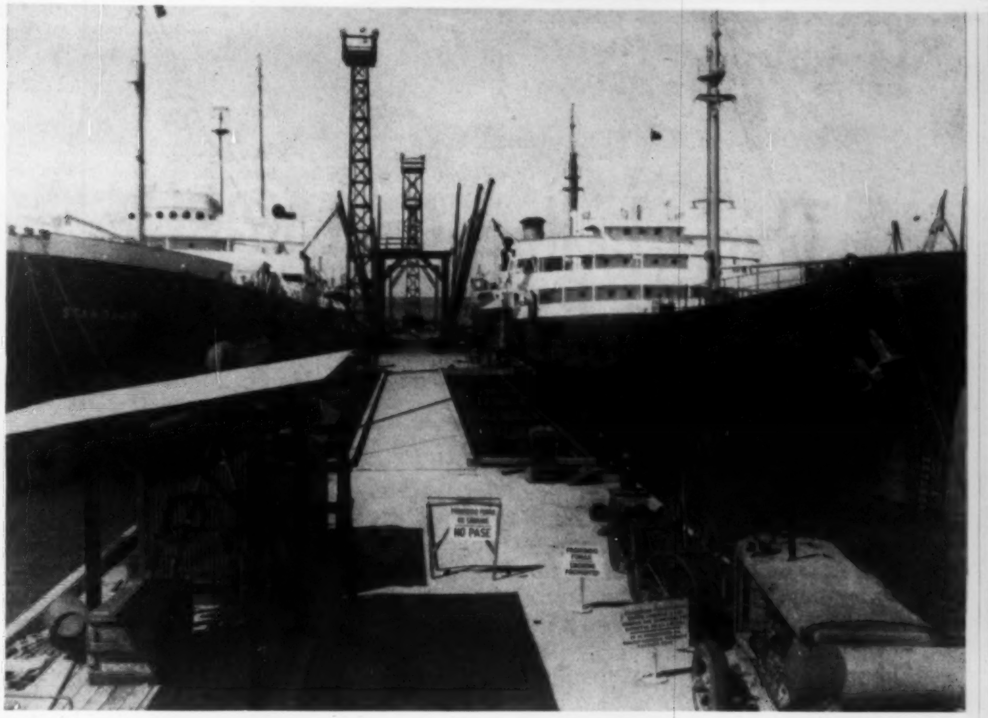
The crude and product-carrying lines are all-welded steel pipes of A.P.I. standard 5-L. The ballast, salt-water and fresh-water lines are cement-lined, cast-iron pipes, with Doublex-Simplex joints. Most of the pipelines are subject to a temperature range between 70 and 140 deg F. To control the magnitude and direction of thermal expansion of the pipelines, anchorage points were established along the length of the lines. At these points the pipelines were fastened to the structure to allow each line to expand in both directions from the anchor. To reduce frictional resistance, the larger pipes (10 in. and over) are supported on special rollers, while the smaller pipes slide on bars and plates. The accumulated thrusts on the anchors of all pipes, transferred to the structure, required bracing of the structure by longitudinally battered piles. In the steam lines, which are subject to a temperature range from 70 to 400 deg F, allowance for expansion was provided by means of loops spaced at 200-ft intervals.

TABLE I. PILE TESTS SHOW DESIGN ASSUMPTIONS TO BE CONSERVATIVE

Tests Made on Piles Penetrating 37 Ft in Hard Material

	Test Results	Design Assumptions
Compressive load . . .	300 tons	100 tons
Tensile capacity . . .	200 tons*	100 tons
Point of fixity	El. −65	El. −50.0

* Equivalent of 1,280 lb per sq ft of outside surface area of pile penetration in firm material



TWO TANKERS berth alongside pier No. 3. Spring fenders protect both piers and ships. Derricks handle loading hoses. Floodlights mounted on steel towers aid night operation.

Special attention was given in the design to protect the steel piers and trestles against corrosion. The protective measures consisted of compactness of details; sealing of all-welded joints and provision for extra thickness of metal at regions of critical stress in the piles; application of protective bitumastic coatings; concrete jackets on the piles in the "between wind and water" region; and a possible installation for cathodic protection. This will probably be the first use of cathodic protection for structures of this type.

All steel was given two coatings of zinc chromate–iron oxide primer either in the fabricating shop or in the field. After the receipt of the steel in the field, the inside and outside of the piles and all structural steel in the superstructure was given a protective coating of Bitumastic No. 50, which was applied by spraying and obtaining a thickness of approximately $^1/_{32}$ in. per coat. After the piles were driven and the superstructure erected, the steel was given a second protective coating of Bituplastic.

To prevent corrosion of the piles in the critical region above and below mean low water, each pile was protected by a concrete jacket, which extends from El. −2.0 to about +5.0.

Cathodic protection may take one of two forms, using either electrolytic or galvanic anodes. A study was made of both methods. The electrolytic method uses an external source of d-c voltage, a battery or rectifier, and expendable anodes of scrap iron or carbon. The galvanic method uses as expendable anodes, metals of a higher electrical potential than the metal to be protected. The natural potential difference between these metals provides the current thus eliminating the necessity for an external power source.

The study indicated that it would be more economical to use the galvanic anode. Magnesium was selected as the galvanic-anode material because of its high voltage differential in combination with steel, and its high electrical storage capacity, amounting in actual use to approximately 500 amp-hr per lb.

The current requirement for protection of clean steel in sea water is in excess of 10 milliamperes (ma) per sq ft of structure. However, currents in the order of 10 ma per sq ft of bare steel will in a short time, approximately three months, reduce the potential of the steel below the corrosion point. (The current required for protection of steel piles in soil is approximately 2 ma per sq ft of bare steel.)

Two or three 50-lb magnesium anodes spaced approximately 20 ft on centers are suspended from the structural steel. The anodes, suspended by means of neoprene jacketed copper wires, are connected electrically and mechanically to the structural steel, which because of the welded connections forms one huge cathode. Thus the current flows from the pier steel, through the sea water, through the magnesium anode, through the copper supporting cable, and back to the steel. To resist corrosion, the supporting eye-bolt and thimble are of monel metal. Anodes will be replaced every year, the supporting detail being designed with this feature in mind. All lines from ship to pier and from pier to shore are electrically insulated with gaskets between pipe flanges. It is planned to put this system in use when the need becomes evident.

Construction by Contract

Contracts for the various subdivisions of the work were awarded on the basis of competitive unit price bids, based on contract drawings, specifications and quantity estimates prepared by the Knappen Tippetts Abbett Engineering Co.

The dredging work, involving about 4,800,000 cu yd, was awarded to the Gahagan Construction Corp. Gahagan used the dredge *Peru*, which has a 29-in. suction line and 24-in. discharge line, a 4,000-hp steam turbine with gear drive on the main pump, and a 650-hp steam cutter engine. The dredge started operations on February 9, 1947. The work was completed on September 12, 1947.

The timber barge dock was constructed by the W. Horace Williams Co. The steel piers and trestles, with all the appurtenant facilities, were constructed by Merritt-Chapman & Scott. The first pile was driven on August 26, 1947, and the work was completed on November 1, 1948.

The terminal facilities were designed for the Standard Oil Development Co., the Esso Engineering Department representing the Creole Petroleum Corp. The late E. H. Kares and his successor, L. W. Schrader, were the staff engineers for the Esso Engineering Department. The resident engineer was L. D. Burritt, and E. L. Wagner, M. ASCE, was the job engineer for Esso. The planning and design were done under my general supervision. Project engineers for the Knappen Tippetts Abbett Engineering Co. were Arthur Ellwood and Barnett Silveston.

For the Creole Petroleum Corp., W. J. Connelly is in charge of manufacturing and H. J. Polk was in charge of the refinery. L. G. Smith is vice-president and coordinator of construction for this job.

Since the terminal is to be used primarily by tankers of the Standard Oil Co. (New Jersey) and its subsidiaries, the Marine Department of that company collaborated in the preparation of the general layout. The over-all harbor plan was conceived by M. G. Gamble, general manager of that company, and the marine aspects of the work were coordinated by F. W. Miller, his technical assistant.

Thin-Shelled Cast-in-Place Concrete Piles Driven 102 Ft

HAL W. HUNT, Assoc. M. ASCE
Executive Engineer, Western Foundation Corp., New York, N.Y.

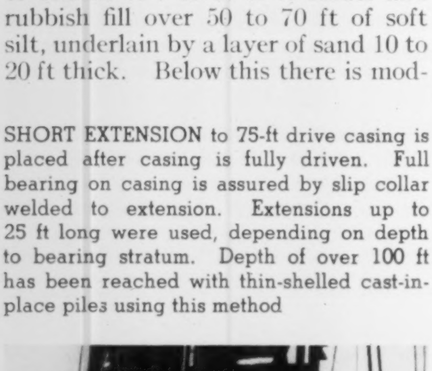
WHEN PILES of 11-in. diameter punctured a shallow stratum of sand underlying 70 to 90 ft of virtually frictionless material on a job in Flushing Meadows, site of the 1939–1940 World's Fair, a satisfactory pile was made by using a 17-in. precast concrete button at the bottom of the pile. Here for the first time depths of over 100 ft were reached by thin-shelled cast-in-place concrete piles. The piles were driven for a bus garage for the New York City Board of Transportation by the Western Foundation Corp.

Borings to determine the nature of the underlying soil were made as part of the construction contract. Subsurface material at the site was found to consist of 7 to 17 ft of cinder and rubbish fill over 50 to 70 ft of soft silt, underlain by a layer of sand 10 to 20 ft thick. Below this there is moderately firm varved clay for at least 30 ft, the maximum depth of the borings. Designs were based on conditions found at nearby structures, which rest on wooden piles. It was expected that for 30-ton bearing, 100-ft piles would be required.

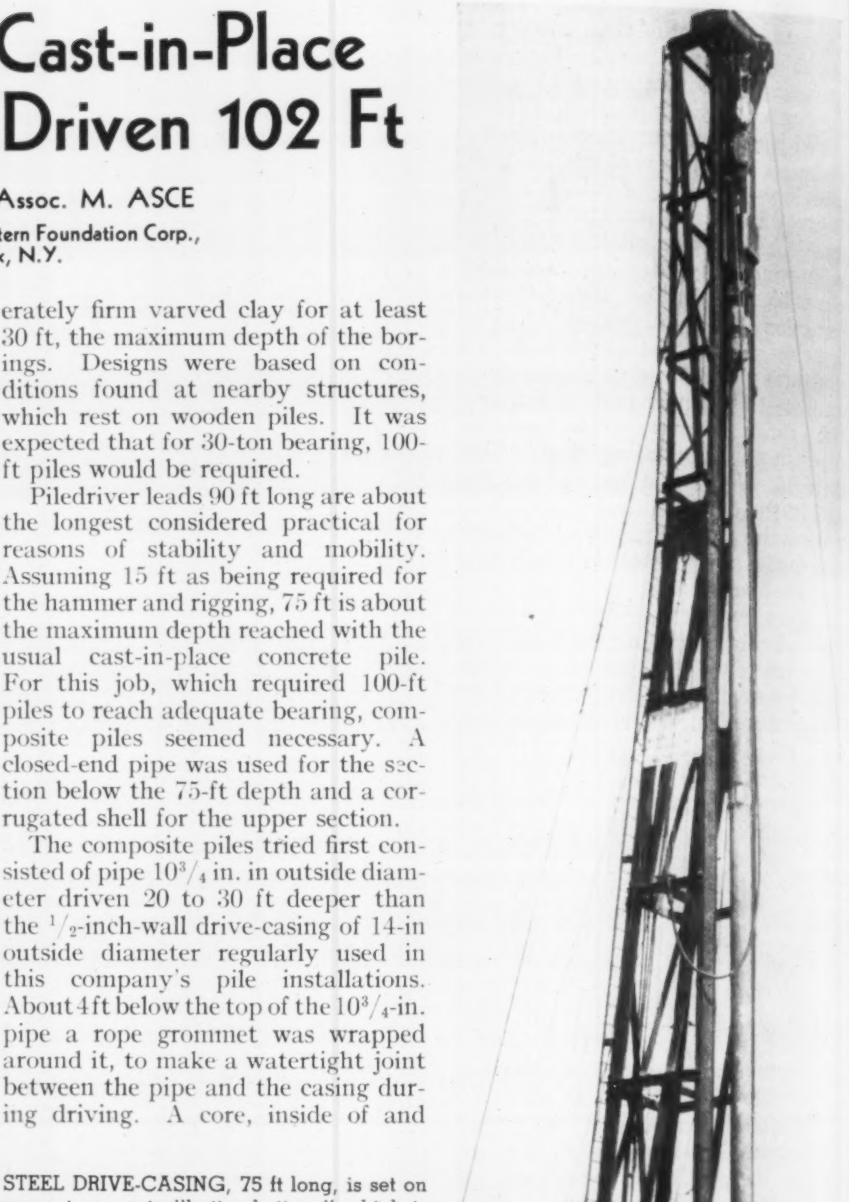
Piledriver leads 90 ft long are about the longest considered practical for reasons of stability and mobility. Assuming 15 ft as being required for the hammer and rigging, 75 ft is about the maximum depth reached with the usual cast-in-place concrete pile. For this job, which required 100-ft piles to reach adequate bearing, composite piles seemed necessary. A closed-end pipe was used for the section below the 75-ft depth and a corrugated shell for the upper section.

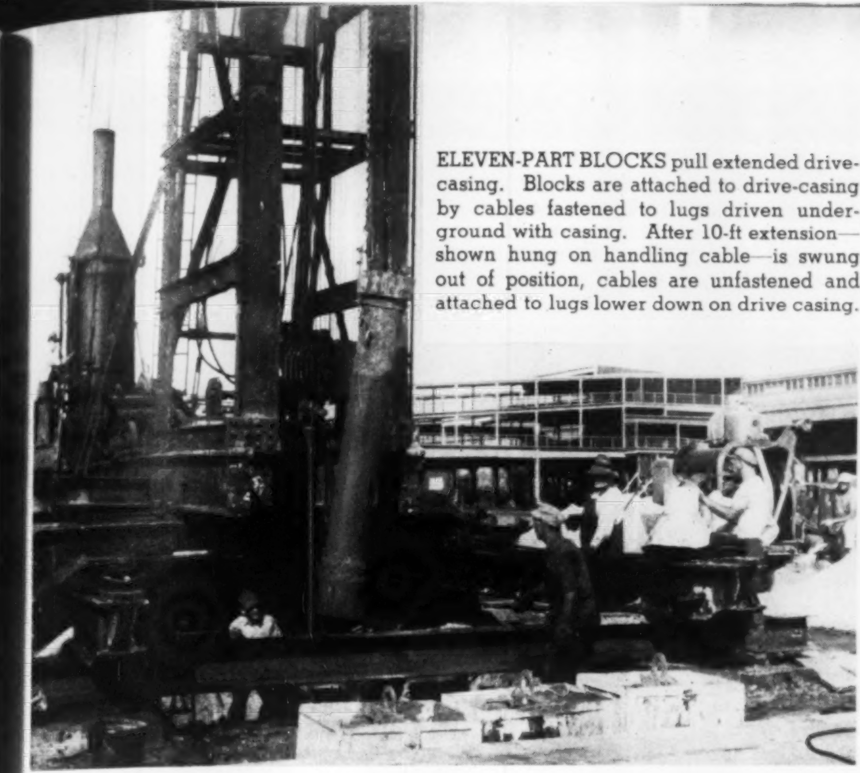
The composite piles tried first consisted of pipe $10^3/_4$ in. in outside diameter driven 20 to 30 ft deeper than the $^1/_2$-inch-wall drive-casing of 14-in outside diameter regularly used in this company's pile installations. About 4 ft below the top of the $10^3/_4$-in. pipe a rope grommet was wrapped around it, to make a watertight joint between the pipe and the casing during driving. A core, inside of and

SHORT EXTENSION to 75-ft drive casing is placed after casing is fully driven. Full bearing on casing is assured by slip collar welded to extension. Extensions up to 25 ft long were used, depending on depth to bearing stratum. Depth of over 100 ft has been reached with thin-shelled cast-in-place piles using this method



STEEL DRIVE-CASING, 75 ft long, is set on precast concrete "button-bottom," which is driven down with it as base for pile. Piles with increased end area provided by 17-in.-dia button supported 45-ton test load, where 11-in.-dia piles failed.





ELEVEN-PART BLOCKS pull extended drive-casing. Blocks are attached to drive-casing by cables fastened to lugs driven underground with casing. After 10-ft extension—shown hung on handling cable—is swung out of position, cables are unfastened and attached to lugs lower down on drive casing.

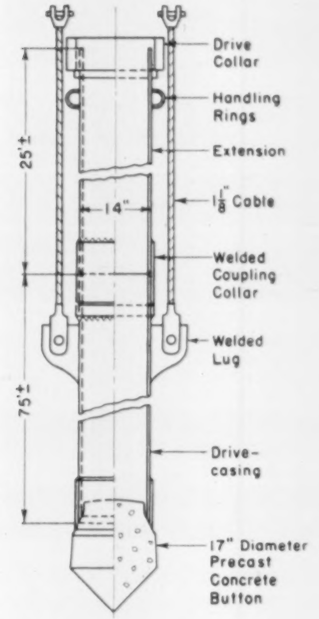


FIG. 1. Section of drive casing and extension shows welded coupling collar in place over casing. Lugs placed well down on long casing permit pulling of complete assembly after lower section is driven far below ground surface. Steel cables of $1^1/_8$-in. diameter connect lugs to eleven-part block used to withdraw entire unit.

about 3 ft shorter than the drive casing, fitted on the $10^3/_4$-in. pipe. The core drove the pipe down simultaneously with the outside casing.

A few blows were necessary to drive the composite pile through the cinder fill, then the pipe and casing went down under the weight of the hammer to a depth of about 60 ft. When the sand stratum was reached, a driving resistance of 20 to 30 blows per ft of penetration was attained. Action of piles under the hammer indicated that the best bearing value was attained with the pile point almost at the top of the sand, the cone-shaped load diffusion providing the minimum unit load on the clay below. Piles carry only the roof of the one-story structure so that loads are light and pile clusters small.

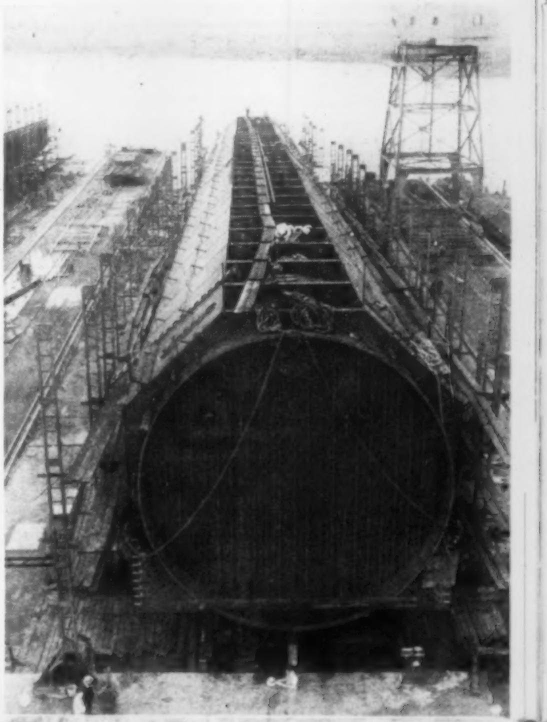
However, when some of the composite piles failed to develop the required bearing, tests were made using a button-bottom thin-shelled cast-in-place concrete pile which fits inside the drive casing and bears on a 17-in.-dia concrete button driven down with the casing. It was necessary to choose a test location where the sand stratum was less than 75 ft below the surface, as 75 ft was then considered the maximum depth of this type of pile. The test pile was driven until 14 blows of a 15,000-ft-lb hammer were required to penetrate the last 6 in. The penetration into the sand stratum was 5 ft. Under a load of 45 tons, the settlement was $^9/_{16}$ in. and the permanent set was only $^5/_{16}$ in., which is permissible.

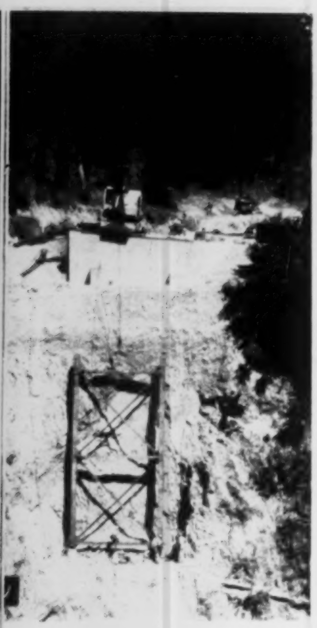
With the decision to use button-bottom piles, it became necessary to make provisions for driving them to depths greater than 75 ft in order to reach the sand stratum. Since it was not practical to increase the length of the leads, an extension to the drive casing was devised, which was swung into place after the 75-ft casing had been driven. Full bearing on the drive casing was insured by a collar welded to the extension. The entire unit was pulled by cables attached to lugs welded to the side of the 75-ft casing, shown in Fig. 1. In some areas the sand stratum was at such a depth that a 25-ft extension was required, and for the first time thin-shelled cast-in-place concrete piles were driven to depths of over 100 ft.

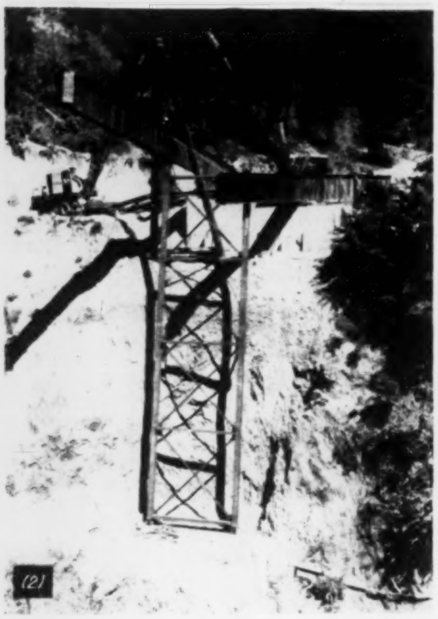
William McNaughton, M. ASCE, Superintendent of Maintenance of Way, had general direction of the work at the Flushing Bus Garage, and A. F. Pfaudler was resident engineer for the Board of Transportation. Ben Miller was project manager for Peerless Construction Co., the general contractors. Taft Shue was superintendent for Western Foundation Corp. on the pile driving.

Prefabricated Sections for Vehicular Tunnel Floated 400 Miles to Site

ALL-WELDED, 375-ft-long tunnel section (right) is one of four similar sections fabricated at Ingalls Shipyards at Pascagoula, Miss. Sections were assembled on standard ship ways, launched and towed to outfitting basin where special launching reinforcing was removed and concrete ballast poured. Sections were then towed 400 miles to Pasadena, Tex., and sunk into dredged trench by addition of tremie concrete between inner and outer shells. After being sunk, sections were fastened together under water, and dredged trench was backfilled. Roadway was fitted into tunnel after positioning was complete and section ends had been removed. Tunnel will provide for two-way vehicular traffic under Houston Ship Channel for Route 225, between cities of Houston and Galveston, Tex.







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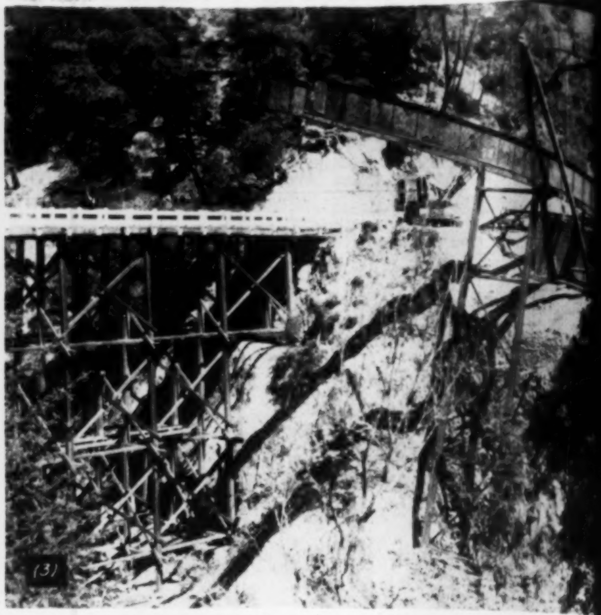


(3)

CAMERA RECORDS SIX MAIN STEPS in erection of Rock Creek Bridge on California's Redwood Highway. (1) Lower half of inclined bent (see sketch of completed bridge below) is pinned in place on bearings on rock ledge below concrete abutment. Bent was previously assembled on ground behind abutment and lowered into position by truck crane on abutment. In next operation (not pictured) top half of bent is likewise placed and riveted to bottom half. Entire bent is then permitted to swing back against bank, where it is braced with timber shoring. Similar operation is performed at abutment on opposite bank. (2) Girders, which have been field spliced, are moved forward and secured in position on top of inclined bent. Timber A-frame was rigged to move girders, which were too heavy for truck cranes. Cranes however were useful in steadying girders during placement. (3) When both girders are in position, cross bracing is placed between them. Later erection steps appear on facing page.

Bents Pivoted on Bottom Pins Permit Easy Erection of Girder Bridge

WENDELL F. POND, Jun. ASCE

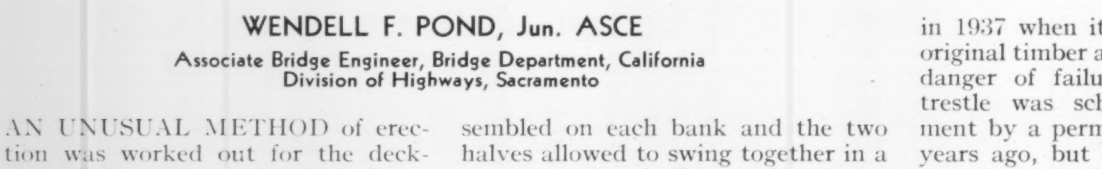
Associate Bridge Engineer, Bridge Department, California Division of Highways, Sacramento

AN UNUSUAL METHOD of erection was worked out for the deck-plate-girder bridge recently built to carry California's Redwood Highway over the 145-ft-deep gorge of Rock Creek, at a point about 190 miles north of San Francisco. Because of the unique arrangement of the steel bents, half of the bridge could be assembled on each bank and the two halves allowed to swing together in a manner quite similar to the closing action of a double-leaf bascule. The chief steps in the erection procedure are shown in the accompanying photographs beginning at the left, above.

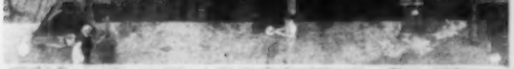
The bridge replaces a temporary timber trestle which was constructed in 1937 when it was found that the original timber arch was in immediate danger of failure. The temporary trestle was scheduled for replacement by a permanent bridge several years ago, but the war caused construction to be deferred.

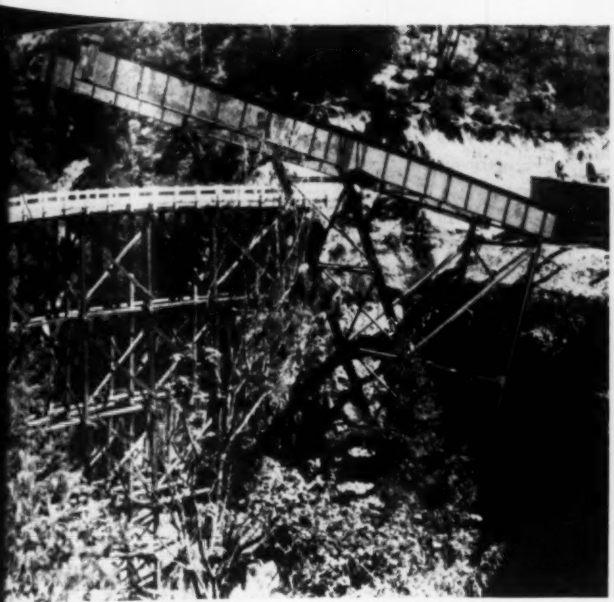
Concrete Arch Found Too Expensive

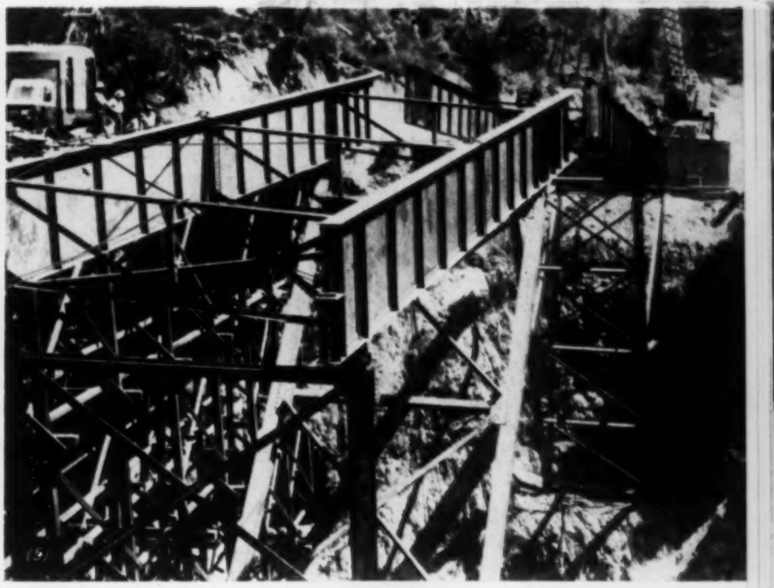
Ordinarily a concrete arch would have been chosen to span the creek, as the deep, relatively narrow canyon is especially adapted to this type of



DESIGNED WITH ERECTION PROCEDURE IN MIND, Rock Creek Bridge is primarily a deck plate girder continuous over three central spans, with hinged approach span at each end. Structure acts somewhat like modified two-hinged arch because of arrangement of four central bents. Splice connecting two halves of bridge is located near right-hand end of center span. Hinges for approach spans are placed near two vertical bents.







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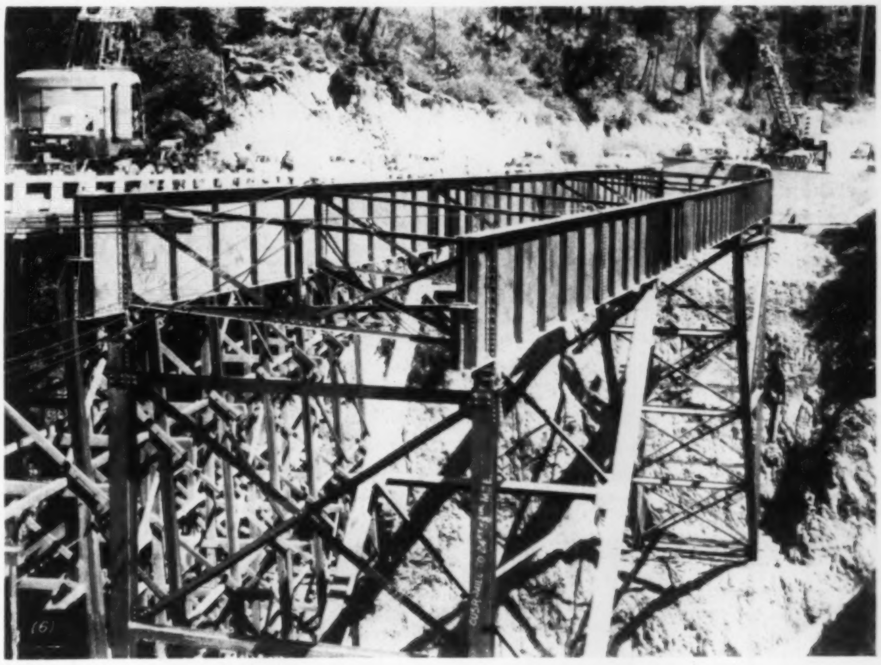

(6)

WINCHES PERMIT two halves of bridge to swing together across 145-ft-deep ravine in three final steps, as follows: (4) Winch on opposite bank pulls inclined bent and attached girders forward until back ends of girders rest against abutment. Vertical bents are then lowered, pinned in place on their bearings, and braced against bank. Back ends of girders are lowered onto vertical bents. At this time bracing is placed between inclined and vertical bents, but final riveting of bracing is postponed until unit is in final position because of relative movement which takes place between bents as unit swings forward over gorge. (5) Two units of bridge are allowed to swing together by slacking off on winches. Just before girder ends come together, two men are swung out by crane operating from existing bridge (top left) to steer ends of girders with spud wrenches until final connection is effected. (6) With two units of bridge in final position, erection pins and bolts are placed in girder splice, two approach spans are erected, and remaining bracing is placed by truck cranes. Cables running back from three-sheave block (seen near end of left-hand girder) are connected to two-drum winch, which is anchored to I-beam deadmen.

structure. A concrete arch, however, requires the erection of extensive falsework and usually a high line. This procedure calls for many man-hours of labor and thousands of board feet of lumber.

In fact an arch type was designed and advertised for bidding, but because of the high cost of labor and lumber, even the lowest of the bids received was far above the true value of the structure. Further studies were then undertaken in an attempt to develop a cheaper bridge. The relatively low bids obtained from contractors for the present structure more than justified the additional time spent on design.

Two-Hinged Arch Action

The bridge is primarily a deck plate girder continuous over three central spans and having two hinged approach spans. The arrangement of the four central bents, however, is such that the structure acts somewhat as a modified two-hinged arch. The bridge is 252 ft long, composed of five spans of the following lengths: 32 ft 6 in., 50 ft, 66 ft, 50 ft and 53 ft 6 in. A reinforced concrete deck, providing for a roadway width of 26 ft, is carried by two plate girders 6 ft in depth and spaced 18 ft 6 in. on centers.

The four bents are pinned at top and bottom and are composed of wide-flange columns braced by T-beams and smaller wide-flange sections. The two exterior bents are vertical, but the two interior bents slope out over the creek for a horizontal distance of about 50 ft from their bottom pins. It is this arrangement which furnishes the arch action. The vertical height of the bents is approximately 57 ft.

Of primary interest is the method used to erect the structural steel. For the most part the erection procedure was determined by the design of the structure. The only pieces of special equipment required were two winches to hold back each of the two halves of the bridge as they were allowed to swing together. A crane large enough to handle the prefabricated bent and girder sections was also used. Before steel erection was started a two-drum winch was set up on the ground back of each abutment and securely anchored to deadmen composed of I-beams.

The Rock Creek Bridge was designed by the Bridge Department of the California Division of Highways. H. W. Ruby of Sacramento was the general contractor, and J. D. O'Brien of Stockton, Calif., subcontracted the steel erection. The writer served as resident engineer for the California Division of Highways.

Engineers' Notebook

Prestretching Increases Strength of Steel T-Beams in University of Iowa Tests

NED L. ASHTON, M. ASCE

Professor of Civil Engineering, State University of Iowa, Iowa City

TESTS MADE at the research laboratory of the State University of Iowa indicate that increased strength in steel T-beams is secured by prestretching. These tests are an extension of previous studies conducted at the laboratory on prestretched reinforcement for concrete beams and on prestretched reinforced concrete beams under impact loading. Some of the tests have previously been reported in CIVIL ENGINEERING ("Prestretched Reinforcing Bars Show High Strength in University of Iowa Tests," by B. J. Lambert and Ned L. Ashton, Members ASCE, December 1945, page 564).

In the tests on structural steel here reported, all seven beams were of balanced design, designed for about 40,000 psi in the compression flange, combined with about 85,000 to 90,000 psi in tension.

A comparison of beams Nos. 5 and 7 is especially interesting. Beam No. 7 was fabricated by welding an ordinary structural steel plate to an ordinary tee, the plate forming the top flange while the tee made up the web and bottom flange. When loaded at the one-third span points in a testing machine, this beam began to yield under a load of 14,250 lb and failed as shown in Figs. 1, 2 and 3, at an ultimate load of 22,545 lb.

Beam No. 5 was made from exactly the same material and in exactly the same way as No. 7 except that both the plate and the T-section were prestretched 7 percent longer than the "as rolled" condition before they were fabricated into the welded beam. In the testing machine the beam was first subjected to a 25,265-lb load. This load was released and the beam reloaded with a 28,720-lb load. The beam was then taken out of the testing machine to be photographed with beam No. 7 (Fig. 2). The two unloading points for beam No. 5 are shown in Fig. 2 as points *A* and *B*. When returned to the testing machine, this beam was subjected to an ultimate load of 33,770 lb before final failure, represented in Fig. 3 by a dotted line.

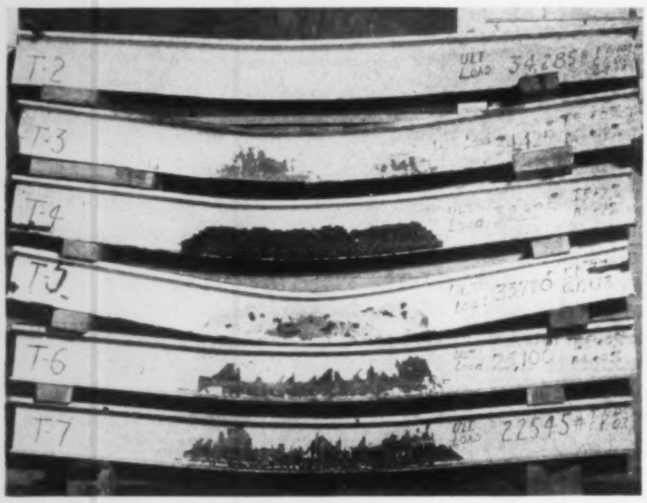

FIG. 1. TESTS ON SEVEN T-BEAMS with and without prestretching show increased strength in beams subjected to prestretching of T-section or of both T-section and plate. Details of test procedure are given in Table I, below.

Another comparison of interest is that between beams Nos. 2 and 3 and beams Nos. 6 and 7, in which the first pair of beams show an average improvement over the second pair of 78 percent (Table I). Beam No. 6 was fabricated exactly like No. 7, previously described. Beams Nos. 2 and 3 were of the same material and fabricated in the same way except that the T-section was prestretched 10 percent before fabrication. The plate was not prestretched in any of these four beams.

The tests here described were carried out under the writer's direction as a joint thesis project by two

TYPICAL T-SECTION is stretched in machine before being assembled into beam for test program. Two graduate students in civil engineering conduct tests for joint thesis at State University of Iowa. Richard L. Buchwalter measures stretch in T-section while Yan Chang Shiu operates controls.

TABLE I. RESULTS OF TESTS ON SEVEN T-BEAMS WITH AND WITHOUT PRESTRETCHING

Beam No.	"T" Prestretched, Percent	Plate Prestretched, Percent	*fs* from Prestretching, psi	Yield Point, *fs* from Beam Test, psi	Yield Point, *fc* from Beam Test, psi	Yield Point Load, Lb	Ultimate Load, Lb
1	7	0	66,300	62,000	32,800	....	....
2	10	0	79,500	78,000	40,200	26,200	34,285
3	10	0	72,000	73,000	38,000	25,000	34,425
4	7	7	63,900	65,500	32,800	22,600	32,825
5	7	7	68,200	71,500	38,700	23,750	33,770
6	0	0	42,000	38,750	17,300	14,500	25,100
7	0	0	43,000	35,800	16,100	14,250	22,545

graduate students, Richard L. Buchwalter and Yan Chang Shiu, for the Master of Science degree at the State University of Iowa. The original report is on file in the Graduate College.

These experiments again demonstrate how the yield point limits the useful range of stress in structural steel for use in permanent structures. For conditions of plain tension or of tension caused by bending, prestretching raises the upper useful limit closer to the ultimate strength of the metal. After stretching the steel behaves elastically through the range of stresses to the ultimate strength. Both the safe design stress and the limiting useful stress are increased in proportion. At working stresses of 50,000 psi in the tension flange these prestretched beams had a greater margin of safety with respect to permanent deformations than the ordinary unstretched beams had when working at 20,000 psi.

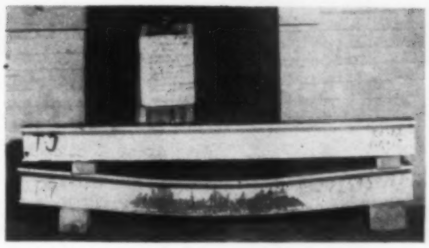

FIG. 2. PRESTRETCHED beam No. 5, following test at 28,720-lb load, is seen beside an ordinary unstretched beam, No. 7, following its failure at 22,545 lb.

The most significant thing about both this series of experiments and the others in regard to prestretched reinforcement for use in concrete beams is the definite indication that our present standard requirements for ductility in the structural grades of steel are not the most desirable. Our structural grades of steel could be used with greater efficiency if they were manufactured with the yield point closer to the ultimate strength.

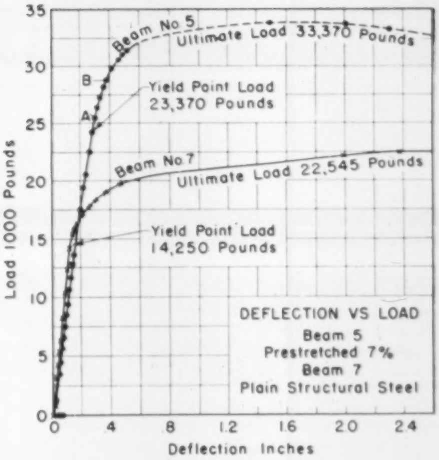

FIG. 3. GRAPH SHOWS DEFLECTIONS of beams Nos. 5 and 7 under various loads. Beam No. 5 was prestretched 7 percent in both T-section and plate before fabrication.

Charts for Footing Design Developed from Studies of Soil Bearing Capacity and Settlement

GEORGE F. SOWERS, Jun. ASCE

Assistant Professor of Civil Engineering, Georgia Institute of Technology; Consulting Engineer, Law-Barrow-Agee Laboratories, Atlanta, Ga.

ONE OF the most important problems in foundation engineering is bridging the gap between the specialized information furnished by the soils engineer and the requirements of the structural designer. Too often the structural designer who demands a thorough field and laboratory investigation is presented with a mass of test data which means little to him. He is responsible for the foundation design, but he lacks the specialized knowledge required to analyze the laboratory data and apply it to his work.

If the soil specialist supplements the laboratory data with charts showing allowable soil pressure as a function of footing size, depth to water table, and other pertinent factors, the designer can make an intelligent analysis of the foundation. Three charts derived from two independent

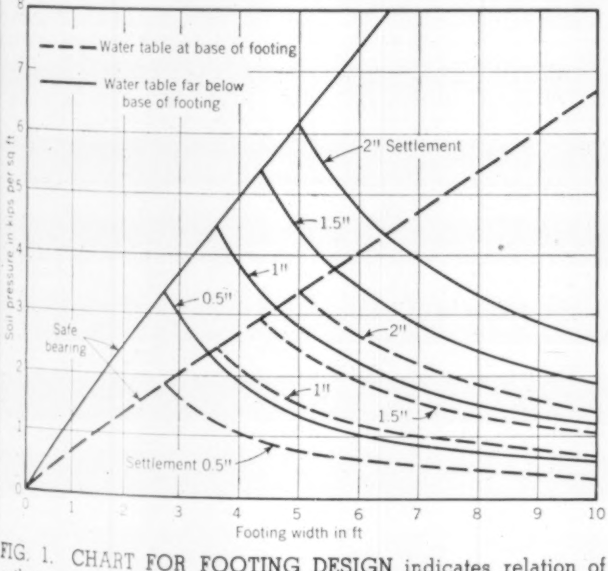

FIG. 1. **CHART FOR FOOTING DESIGN** indicates relation of soil pressure to footing width for safety against soil failure and for specified amount of settlement.

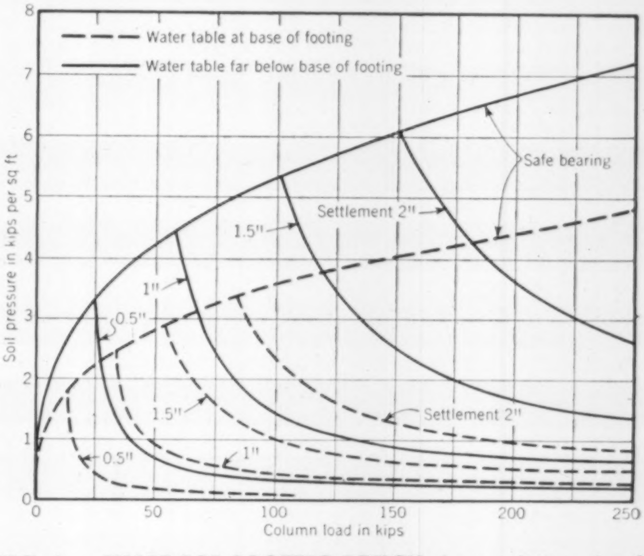

FIG. 2. **CHART FOR FOOTING DESIGN** shows relation of soil pressure to column load for safety against soil failure and for specified amount of settlement.

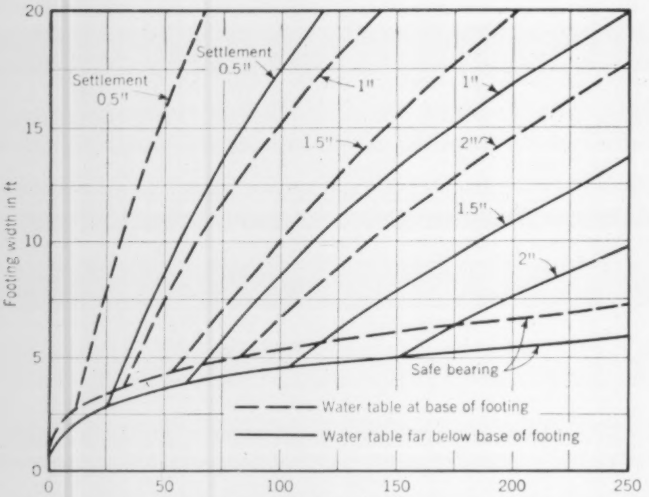

FIG. 3. CHART FOR FOOTING DESIGN gives relation of footing width to column load for safety against failure and for specified amount of settlement.

studies made by the soils engineer are here presented (Figs. 1, 2 and 3).

Making the Soil Studies

The first study involves bearing capacity—the ability of the soil to carry loads without failure. This ability may be determined by an adequate program of load tests, with each test carried to the point of failure. This information must be extrapolated to predict the soil capacity under the load of full-size footings of different assumed sizes and shapes. Bearing capacity may be determined more easily through laboratory tests for shear strength, and formulas such as those developed by Terzaghi.[1]

The effects of a fluctuating water table, or of lowering the level of the footings may be studied more readily by formulas than by load tests, and the total cost is much less.

The second study involves settlement—the deflection of the soil under load by both distortion and compression. In the case of sands, both distortion and compression can be determined by a program of load tests. In clays, distortion can be estimated by load tests or by laboratory tests on undisturbed samples, but compression must be determined by stress analyses of the soil under load, combined with laboratory data on compressibility. Donald W. Taylor[2] described a typical procedure used in making a settlement study. Such a study must be repeated for different assumed sizes of footings, different column loads, various depths of basement excavation, and for several possible levels of the water table.

Three types of charts may be derived from the studies that have been outlined. The first type, Fig. 1, shows soil pressure as a function of footing width. The bearing capacity of the soil, reduced by a proper safety factor, represents the upper limit of allowable soil pressure. A family of curves below this line shows settlements of square footings of different widths and soil pressures. Separate charts may be made for different footing shapes and for various depths of basement excavation. With the aid of these charts the designer can establish the safety and settlement of alternative footing designs.

The second type of chart, Fig. 2, is useful in determining the size of footing required to carry a given column load. It is derived from the first chart by multiplying the soil pressure by the footing area for points on each of the curves. The product of soil pressure and footing area is the column load and forms the abcissa of the new chart. Soil pressure is again the ordinate. In order to find the allowable soil pressure, the designer enters the chart with the column load, goes to the curve that indicates the settlement which the structure can withstand, and reads the soil pressure on the ordinate. If all footings are designed to have the same settlement, distortion of the

(*Continued on page 74*)

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[1] Karl Terzaghi and Ralph B. Peck, *Soil Mechanics in Engineering Practice*, New York, John Wiley and Sons, Inc., 1948, p. 171.

[2] Donald W. Taylor, *Fundamentals of Soil Mechanics*, New York, John Wiley and Sons Inc., 1948, p. 268.

Improved Bricklaying Technique Prevents Leakage

JOSEPH R. FARRELL, M. ASCE
Joseph R. Farrell, Inc., Philadelphia, Pa.

BRICK WALLS which are designed as a facing are generally thin and are subject to leakage in climates where long continued rain and high winds prevail, with the result that capillary action is set up in the joints between the masonry. To overcome this failing it is necessary to eliminate two common practices which have long been employed by bricklayers.

Anyone watching a bricklayer at work will notice that he lays the mortar for the bed joint and then forms a furrow with the point of his trowel along the entire length of the joint on the center line of the brick, with a ridge along each edge. The brick for the next course is laid on these two ridges and pressed down and the mortar which squeezes out on the face of the wall is cut off with the trowel and put on the end of the brick just laid.

If one of these bricks is lifted immediately after laying, it will be found that the hollow caused by the furrowing of the joint, while reduced, has not entirely disappeared, and the finished wall is full of hollow tubes which hold water and create hydrostatic pressure. Also, the mortar that is cut off when the brick is laid is not sufficient to fill the head joint entirely, so that it is possible for water to enter at this point.

To avoid this difficulty the specifications should state that all bed joints are to be troweled flat and all head joints filled solidly by buttering the end of each brick before it is laid. Also it should be specified that the back of the face brick is to be parged or dashed with mortar before the backing is laid. Very little water will penetrate a 4-in. wall laid in this manner.

The next step—to catch whatever water does penetrate through the face-brick layer—is to provide an air space between the face brick and the backing. A recess then catches the water at the bottom of the spandrel wall and weep holes permit drainage.

When consistently followed, this method of laying brick has been proved effective in preventing leakage.

Technical Language—A Universal Tongue

HAROLD T. LARSEN, M. ASCE
Editor of Technical Publications, ASCE

CIVIL ENGINEERING, in common with other useful arts, speaks a language derived in great measure from the pure science of mathematics. This is a language of symbols—abbreviations for concepts that can be interchanged for their numerical equivalents. One would expect letter symbols to lend themselves naturally to the growth of a single mathematical framework of thought transference, recognizable by the word-speaking part of the animal kingdom anywhere on the surface of the earth. Alas, 'tis not so!

Even as the word "bum" means one thing in Brooklyn and something else again in London, and rubbing noses as practiced by the Eskimos is never adequate to express the same idea in Washington, so also do the letters of all the alphabets in existence mean different things to the "tradespeople" of mathematics. The complex, net, result is a "snafu" that crisscrosses the buzzing interchange of human ideas and, believe it or not, sometimes causes misunderstandings which in turn cause wars.

For approximately twenty years ASCE—acting in concert with several other organizations under the guiding sponsorship of the American Standards Association—has been "doing something about" the letter-symbol problem. As a result, lists of standard letter symbols have been prepared covering the fields of aeronautics, mathematics, electricity, electric traction and signaling, hydraulics, mechanics, thermodynamics and chemistry. A new set of symbols of special interest to civil engineers has now run the gamut of committee review and the general give and take of public review, to stand before the sponsor bodies for official approval. This is the proposed "American Standard Letter Symbols for Structural Analysis" prepared under the chairmanship of Albert Haertlein, M. ASCE, Professor of Civil Engineering, Harvard University Graduate School of Engineering. The list follows.

Letter Symbols for Structural Analysis

α	acceleration, angular
g	acceleration due to gravity
a	acceleration, linear
θ	angular distance in slope deflection
A	area
b	breadth (width)
f	coefficient of sliding friction
α	coefficient of thermal expansion, linear
y	deflection or ordinate to the elastic line of a beam at distance x
ϕ	deformation, total angular
y	deformation, total displacement of a panel point of a truss or a point on the elastic line of a beam
ϵ	deformation, unit linear
ρ	density, mass per unit volume $= \gamma/g$
h	depth (height or thickness)
d	depth from compression face of beam or slab to center of longitudinal tensile reinforcement
D	diameter
s	distance, arc length
s	distance, linear
c	distance, neutral axis to extreme fiber
e	eccentricity of application of load
η	efficiency
δ	elongation, total
E_k	energy, kinetic*
E_p	energy, potential*
F	force
u	force in any bar of a framed structure due to a unit load applied at a given point in a given direction
P	forces or loads, concentrated
F	frequency
h	height (depth or thickness)
I	inertia, rectangular moment of (area)
I_{xy}	inertia, product of (area)
L	length
w	load per unit distance or per unit area
G	modulus of elasticity in shear or rigidity
E	modulus of elasticity (Young's modulus)
R	modulus of rupture
m	moment at any section of a beam due to a unit load or to a unit moment applied at a given point
Q	moment of area (statical or first moment)
M	moment of force, bending moment
c	neutral axis, distance to extreme fiber from
μ	Poisson's ratio
J	polar moment of inertia
p	pressure, normal force per unit area
r	radius
r	radius of gyration of an area (k also is used)
p	ratio of area of steel to area of concrete in reinforced concrete beam
k	ratio of distance from neutral axis to outer compressive fibers to distance from outer compressive fibers to point of application of resultant tensile stress (reinforced concrete)
j	ratio of distance between the resultant compressive stress and the resultant tensile stress to the distance from the outer compressive fiber to the resultant tensile stress in a reinforced concrete beam
n	ratio, modulus of elasticity of steel to modulus of elasticity of concrete
R	reaction
h	rise of an arch or sag of a cable
Z	section modulus
V	shearing force in beam section
v	shearing stress in concrete
K	stiffness factor $= I/\text{span}$
ϵ	strain, normal
γ	strain, shear
K	stress concentration factor
s	stress, normal per unit of area
s_s	stress, shear per unit of area
u	stress, unit bond, in reinforced concrete
f_c	stress, unit compressive in concrete
f_s	stress, unit tensile in steel in reinforced concrete
t	temperature, Fahrenheit or Centigrade
t	thickness (h also is used)
t	time
T	torque
C	total compressive force in concrete
T	total tensile force on steel in reinforced concrete
W	total weight
ω	velocity, angular
v	velocity, linear
V	volume
W	weight
w	weight per unit distance
γ	weight per unit volume
b	width (breadth)
W	work

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* Use T and V for problems in elasticity (avoids confusion with Young's modulus).

Extra reprint copies of the foregoing list can be purchased for 25 cents each on request to ASCE Headquarters, 33 West 39th Street, New York 18, N.Y.

... THE READERS *Write*

Cites Use of Spiral Flow Theory in Sewer Design

Dear Sir: There is much of interest in the article, "Spiral Flow Increases Capacity of Vertical Discharge Shaft," by M. Mortard, in the December issue. It brings to mind a previous use of the spiral flow theory.

According to Bulletin 17 of the American Concrete Pipe Association, *Concrete Pipe in American Sewerage Practise,* which was published in 1938, the spiral flow idea was used in a sewer in Vancouver, B.C., and described in *Engineering and Contract Record* for May 6, 1936. This sewer not only fed its flow tangentially to the 200-ft-high shaft, but also maintained spiral flow for that great distance by incorporating rifling in the 48-in.-diameter concrete lining.

The purpose of the structure is to avoid damaging floods in the Jordan River at Vancouver, B.C. Surface water is collected by a system of drains and carried to a receiving chamber by two reinforced concrete pipes of 35 and 39-in. diameter, both entering tangentially. Passing through screens, the water enters the vertical shaft where helical ribs help to maintain the spiral flow. From the bottom of the shaft, the water goes through a short section of 20-in. pipe to a 48-in. concrete tunnel 404 ft long. The 20-in. pipe slopes upward so that there is always at least 3 ft of water at the foot of the shaft.

In addition, the 20-in. pipe serves to throttle the flow so that the water rises 80 to 100 ft in the shaft, the velocity in the tunnel gradually increasing. At the end of the tunnel, there is a 36-in. pipe on a steep grade, terminating in a concrete flume and dispersing the water at low tide over a pebbly beach. It is estimated that the falling water may develop 3,000 hp and, to avoid any destructive results, the spiral design was adopted.

Much of this letter is adapted from the previously mentioned bulletin of the American Concrete Pipe Association. It would be interesting to know how the Vancouver sewer structure has held up under use.

Herman Soifer, Jun. ASCE

Brooklyn, N.Y.

Nomograph for Determining Laboratory Soil Permeability Coefficient Simplified

To the Editor: The nomograph for determining soil permeability coefficient, presented by B. C. Wilkas in the June 1948 issue, is very interesting. The advantages of the nomograph are very real. However, any nomograph to be of ultimate value should be designed in a form requiring the least steps for the solution. The nomograph as presented can be redesigned to eliminate part of the steps for nearly all determinations. The present discussion includes a redesign of the nomograph, with this fact taken into consideration.

For one sample during one permeability test, the head-tank factor (F) and the constant head of percolating water (H_{wc}) usually remain constant. The thickness of the specimen (L'_s) also remains constant. The factors which are variable are the difference in head-tank readings (R), the elapsed time (t'), and the temperature of the percolating water (T). This consists of three constant factors and three variable factors to be considered in the solution. If the constant factors are solved first and the variable factors last, the constant factors need only be solved once, during any one test, unless F or H_{wc} changes. This eliminates two steps in all following solutions. The redesign of the nomograph included here (see next page) solves for the constant factors first and the variable factors last.

It may be of interest to know the origin of the equation used in the article. This equation is an adaptation of Darcy's law: $v = ki$, when k is coefficient of permeability; i is hydraulic gradient; and v is discharge velocity. Discharge velocity may be defined as the quantity of water that percolates in a unit time across a unit area of a section oriented at right angles to the flowline. Hydraulic gradient is a pure number and is the

$$\frac{\text{head of percolating water } (H_{wc})}{\text{thickness of specimen } (L'_s)},$$

then Darcy's equation becomes:

$$v = k\frac{H_{wc}}{L'_s} \quad \ldots\ldots (1)$$

and, therefore,

$$k = \frac{L'_s v}{H_{wc}} \quad \ldots\ldots (2)$$

further by definition

$$v = \frac{Q}{A_s t'} \quad \ldots\ldots (3)$$

When Q is the quantity of water ($R \cdot F$); t' is the elapsed time; and A_s is the cross-sectional area of the specimen through which the water passes. Then Equation (2) becomes:

$$k = \frac{L'_s RF}{t' A_s H_{wc}} \quad \ldots (2.1)$$

The desired unit for coefficient of permeability is feet per year. Since, during the test, L'_s is measured in inches, RF is measured in cubic centimeters and t' is usually measured in hours, conversions are necessary. The following conversion factors are applicable: L'_s (in inches) = $L'_s/12$ (in feet); RF (in cubic centimeters) = $RF/28{,}320$ (in cubic feet); t' (in hours) = $t'/8{,}760$ (in years); then equation (2.1) becomes:

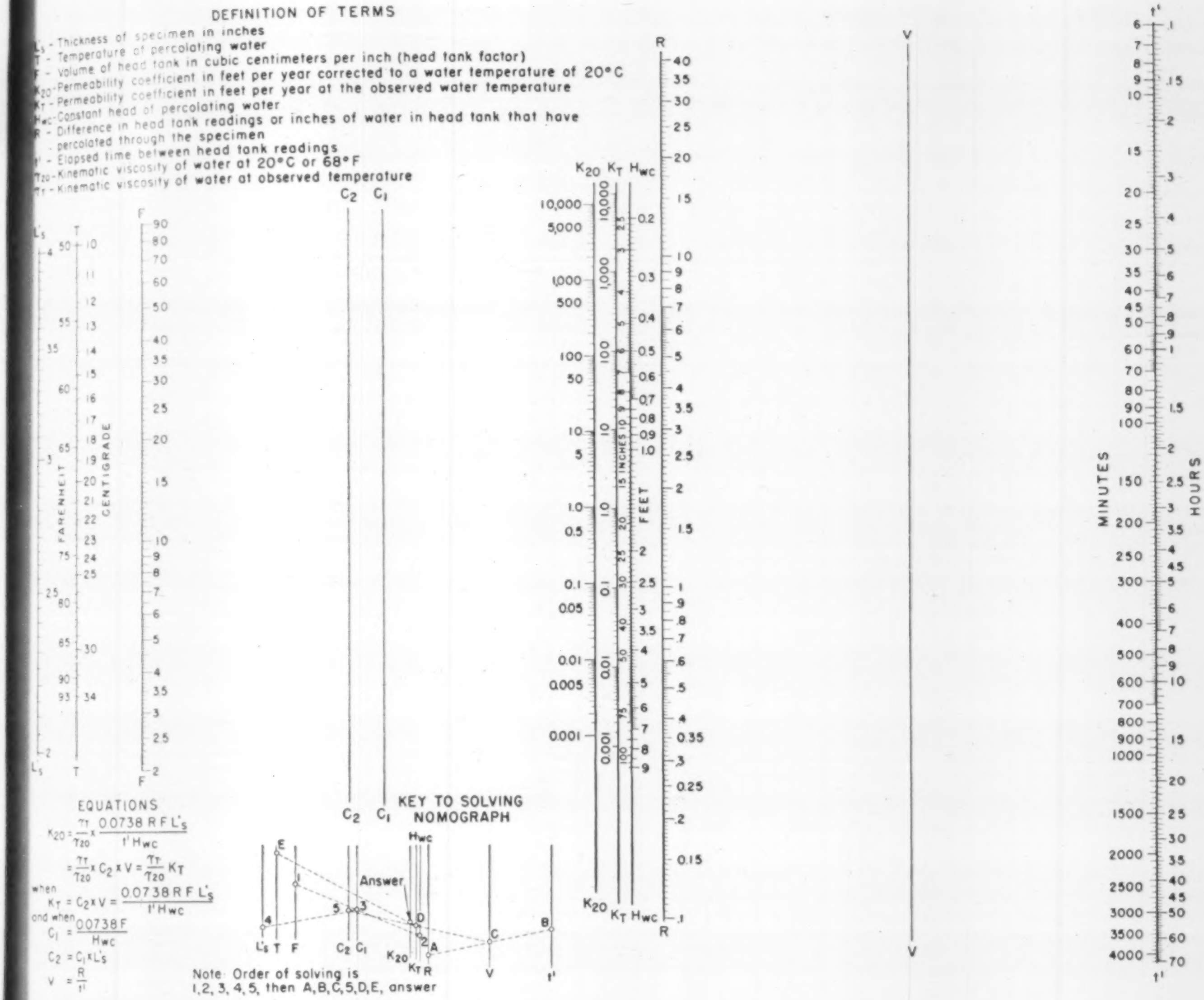
$$k = \frac{L'_s \cdot \dfrac{RF}{28{,}320}}{\dfrac{t'}{8{,}760} \cdot \pi \dfrac{(4)^2}{(12)} \cdot H_{wc}} = \frac{0.0738RFL'_s}{t' H_{wc}} \quad (2.2)$$

Thus far, k has been expressed as permeability coefficient at any temperature, and it now will be indicated by the symbol (k_T) or $k = k_T$. The viscosity of water decreases with increasing temperature. Consequently, the coefficient of permeability depends upon the temperature at which the test is performed. The coefficient of permeability may be computed at 20 deg C, considered as standard, by means of the equation:

$$k_{20} = k_T \frac{\gamma_T}{\gamma_{20}} \quad \ldots\ldots (4)$$

where k_{20} is the coefficient of permeability corrected to a temperature of 20 deg C; k_T is the coefficient of permeability at the observed temperature; γ_T is the kinematic viscosity of the percolating water at the observed temperature; and γ_{20} is the kinematic viscosity of the water at 20 deg C. Then Equation (4) becomes:

$$k_{20} = \frac{\gamma_T}{\gamma_{20}} \cdot \frac{0.0738RFL'_s}{t' H_{wc}} \quad \ldots (4.1)$$


DEFINITION OF TERMS
L'_s - Thickness of specimen in inches
T - Temperature of percolating water
F - Volume of head tank in cubic centimeters per inch (head tank factor)
K_{20} - Permeability coefficient in feet per year corrected to a water temperature of 20°C
K_T - Permeability coefficient in feet per year at the observed water temperature
H_{wc} - Constant head of percolating water
R - Difference in head tank readings or inches of water in head tank that have percolated through the specimen
t' - Elapsed time between head tank readings
η_{20} - Kinematic viscosity of water at 20°C or 68°F
η_T - Kinematic viscosity of water at observed temperature
L'_s
T
FARENHEIT
CENTIGRADE
F
C_2
C_1
K_{20}
K_T
H_{wc}
INCHES
FEET
R
V
t'
MINUTES
HOURS
EQUATIONS
$K_{20} = \frac{\eta_T}{\eta_{20}} \times \frac{0.0738\,R\,F\,L'_s}{t'\,H_{wc}}$
$= \frac{\eta_T}{\eta_{20}} \times C_2 \times V = \frac{\eta_T}{\eta_{20}} K_T$
when
$K_T = C_2 \times V = \frac{0.0738\,R\,F\,L'_s}{t'\,H_{wc}}$
and when
$C_1 = \frac{0.0738\,F}{H_{wc}}$
$C_2 = C_1 \times L'_s$
$V = \frac{R}{t'}$
KEY TO SOLVING NOMOGRAPH
Answer
E
1
4
5
3
D
2
A
C
B
L'_s T F
C_2 C_1
K_{20} K_T H_{wc} R
V
t'
Note: Order of solving is 1, 2, 3, 4, 5, then A, B, C, 5, D, E, answer

Equation 4.1 is used in determining the permeability coefficient with the nomograph. A breakdown of the equation is shown under the heading, "Equations," in the lower left-hand corner of the nomograph. The constant factors in the equation, with the exception of temperature (T), which is variable, are on the left side of the nomograph; the variable factors are on the right side. In solving the nomograph, the following steps are required:

1. Straightedge from the F-scale (Point 1) to the H_{wc}-scale (Point 2) and obtain the first constant on the C_1-line (Point 3).

2. Then straightedge from Point 3 to the L'_s-scale (Point 4) and obtain the second constant on the C_2-line (Point 5)—this point is then semipermanently marked.

3. Then, starting over, straightedge from the R-scale (Point A) to the t-scale (Point B) and obtain on the V-line Point C.

4. Then straightedge from Point C to Point 5 (semipermanent point) and obtain k_T (Point D).

5. Then straightedge from Point D to the T-scale (Point E) and obtain the permeability coefficient answer on the k_{20}-scale.

It is to be noted that only the last three steps (listings 3, 4, and 5) are necessary in all solutions after the first for any one test. This compares with five steps required for each solution with the original nomograph, thus eliminating duplicate work for factors which remain constant. It further decreases the time required for the determination of the coefficient, which is one of the advantages of the nomograph.

The use of the redesigned nomograph, with original size 28 in. by 36 in., makes possible a determination of the coefficient of permeability with an accuracy of from 2 to 5 percent. This is dependent upon the degree of care exercised in procedures and the logarithmic scale interval at the final point on the nomograph.

John A. Meredith
Engr., Bureau of Reclamation
Denver, Colo.

Opposes Reduction in "Proceedings" Content

To the Editor: The usefulness of the civil engineering profession in serving the well being of the nation is measured only by the efficiency of our solution of problems arising from actual life. Likewise, the value of technical articles is measured only by their contribution to the efficiency of structures and not by their classification as papers or discussions. The desire of the Committee on Publications (December issue, page 59) to make space available for papers by abbreviating discussions in Proceedings is, therefore, not justifiable from the point of view of public interest.

Engineering structures involve the expenditure of large public funds as well as of materials of great importance in the economic life of the country. Discussions of papers dealing with actual structures represent, therefore, a special class. Presentation of one more variation of a general method of analysis is insignificant in national economy, but steel buried uselessly in structures affects the life of every individual. Structures publicized in the PROCEEDINGS have been copied indiscriminately—a double-track railroad bridge, for instance, for H-12.5 highway live load one twentieth as heavy. By means of discussion, rational selection of the type, proportions, and details of such a structure may be emphasized.

The PROCEEDINGS is the only forum in the country in which the economic, professional, and educational interests of the nation can be defended by means of discussion. Under prevailing conditions, equal importance cannot be ascribed, therefore, to discussions dealing with actual structures, and to all others, in judging the best utilization of the available space. A good way to save space would be to require that publicly financed research be published in full by the financing agency instead of printing excerpts from such material in PROCEEDINGS.

A considerable condensation of discussions is possible only if all readers possess equal knowledge. Extensive experience has indicated, however, that even persons regarded as outstanding experts have misunderstood, or surmised diametrically the opposite of the meaning intended, because it had been wrongly assumed that they were familiar with the literature on the subject. In such instances, condensation may lead not only to the use of more space in closing discussions but also to a complete confusion of issues.

In deciding what would "serve the ideal of the greatest good to the greatest number," the essential duties of the professions and its role in the economic life of the nation should receive primary consideration.

LOUIS BALOG
Consulting Engineer

Binghamton, N.Y.

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Urges Use of Box Sections in Long-Span Arches

TO THE EDITOR: The Podolsko Bridge, described by J. J. Polivka in the January number of CIVIL ENGINEERING, has an airiness hardly surpassed by any steel bridge of similar span. It is a welcome change from the American standard design, and ought to be an inspiration to bridge engineers here.

Spandrel arches equal to one quarter of the length of the span or more are not new, having been used occasionally by French, Italian and Spanish engineers a long time ago. Such arches do not necessarily make the cost of the bridge lower than spandrel girders of say 35-ft span, supported by sets of 2 or 3 columns, depending on the width of the bridge.

Although of conservative design, as shown by the deflections, the Podolsko Bridge contains in the main arch about 50 per cent more concrete as well as more steel than the 500-ft arch of 120 ft rise, designed for 100-lb live load and 20-ton trucks in the writer's pocketbook, published in 1909. The high cost of the centering of heavy arches of great rise should induce engineers to adopt box sections for arches of such design that only the lower half of the box is carried by the centering and is self-supporting after the concrete has set, so that the centering has to be designed for only one half the weight of the arch.

L. J. MENSCH, M. ASCE
General Contractor

Evanston, Ill.

Discusses Formulas for Concrete Column Design

DEAR SIR: In connection with Mr. Tommerup's paper in the November issue, presenting simplified formulas for the design of concrete columns under axial load and skew bending, I should like to point out a discrepancy involved in the author's selection of the neutral axis as being horizontal (normal to the direction of bending).

A study of the theory of unsymmetrical bending shows that the direction of the neutral axis almost always deviates from that chosen by Mr. Tommerup. Therefore, the formulas derived in the paper are based on an assumption that the author fails to point out in his article.

Such an assumption may hold good in certain cases, and in other cases it may lead to erroneous results due to unbalanced lateral moments of a great magnitude. Mr. Tommerup does not impose any limitations on the use of his formulas. If they are to be followed blindly, they might produce results that are very much in error. For example, the following problem was investigated both according to Mr. Tommerup's recommendations and by an exact method described by M. Bakhoum in an article that appeared in the Journal of the American Concrete Institute, April 1948.

Section: Rectangular 32 in. × 16 in.
Eccentricity, e: 30 in.
Compressive steel reinforcement: none
Tensile steel reinforcement: $1\frac{1}{2}$ sq in.
Longitudinal central plane inclined at an angle of 40 deg with the horizontal
n: 10.

The foregoing values were arbitrarily chosen to give a triangular compressive area and thus insure the applicability of Mr. Tommerup's formula. The position of the neutral axis as determined by each of the two procedures is given in Fig. 1.

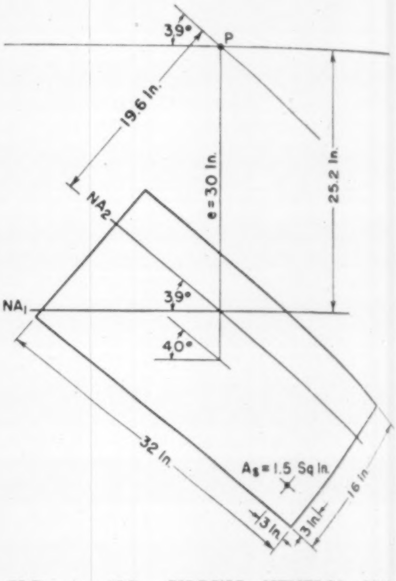

FIG. 1. NA_1 SHOWS NEUTRAL AXIS determined according to Mr. Tommerup's method, and Na_2 neutral axis determined by exact method.

The following comparison in stresses was made for a load of 30,000 lb.

	TOMMERUP	EXACT	PERCENTAGE DIFFERENCE
f_c	1,230 psi	1,300 psi	5.7
f_s	18,400 psi	27,400 psi	48.9

The error in both the concrete and steel stresses is on the unsafe side and it runs as high as 50 percent. On the other hand, the illustrative example presented in the article was computed by the same exact method and the stresses were found to be in excellent agreement with those given by the author, although the exact direction of the neutral axis was found to deviate by about 9 deg clockwise from the assumed direction.

The above discussion leads to the conclusion that the assumption that the neutral axis is always normal to the direction of bending is an unreliable one and in the absence of any limitations the method recommended by Mr. Tommerup should be applied with the greatest degree of caution and in case of doubt it should be abandoned.

A. D. KALIVOPOULOS, Jun. ASCE

Urbana, Ill.

SOCIETY NEWS

ASCE Convention in Mexico Seen as Timely Boon to Engineering Relationships

CARLTON S. PROCTOR

Vice-President, ASCE

IN THE LIGHT of remarks made by ASCE President Franklin Thomas in his inaugural address, in which he depicted this year as one presenting "an especial opportunity and challenge to the Society in respect to international relations among engineers," some personal experience in engineering practice in Latin America may be of interest to members of our Society; for the writer agrees wholeheartedly with Dean Thomas that "the holding of our Annual Convention next July in the capital of our neighboring Republic of Mexico will be an event of great significance."

The steady, healthy growth of professional practice in Latin America by engineers from the United States has contributed fully as much as any other factor in the recent marked improvement in inter-American relations. Almost without exception, those North American engineers who have gone into Latin America with an understanding of its history, culture, and traditions, an awareness of the strong nationalistic differences between the several Republics, and a sympathetic approach to their problems and aspirations, have enjoyed a fruitful and profitable practice and have established warm, sincere friendships.

On the other hand, those engineers from the United States who have approached Latin-American problems with the attitude that U.S. standards and practice must set the standard for all peoples, and those who cannot enjoy and profit by the fine cultural attainments and warmth of friendships of our Southern neighbors, usually return as critics, after unsuccessful and sometimes unpleasant engineering engagements.

At no time in the past has the atmosphere been as congenial for North American engineers' practice in Latin America, or the need more pressing and the opportunities greater. Just as our own great era of construction of railroads, canals, bridges, public works, and utilities of all types, received its impetus from the rush of European immigration seeking opportunity and peace following the Napoleonic Wars, so Latin America is growing and developing today.

These were the primary considerations leading to the acceptance by the ASCE Board of Direction of the invitation to hold our 1949 Summer Convention in Mexico City. With the support of the membership that this Convention deserves, and an appreciation of the potentialities of such an international meeting, much may be accomplished to further cement inter-American friendships and understandings, and to further extend the advantages of our technical skills to our Southern neighbors.

THE ANNUAL CONVENTION of the ASCE in Mexico City, July 13–16, will be held at the Hotel Del Prado. Combined with the usual, excellent technical program, will be the opportunity to contrast the engineering accomplishments of ancient Indian civilizations, with the engineering skills of today's young republic. The committee in charge of arrangements is headed by Charles M. Upham, Washington, D.C. Further details of the Convention will be forthcoming in subsequent issues of "Civil Engineering."

Prior to World War II, German influence predominated in Latin-American engineering training and practice. Today, the textbook of the Latin-American engineering student and his engineering standards and practice come from the United States.

While much of the credit for this improvement must go to Nelson Rockefeller, Wally Harrison, and the others of his associates working for inter-American friendship, nevertheless our engineer is doing a most constructive job.

The Board of Direction of ASCE recognized the timeliness of a Mexico City meeting this year, notwithstanding the demand for maximum economy dictated by the defeat of the dues amendment. Therefore, in approving this Convention, the Board ruled that mileage expenses of all Board members will be paid to the Mexican border only, Board members to pay their own way for all travel within Mexico. Hence, the expenses to the Society will be less than for the usual Summer Convention on the Pacific Coast.

Pan-American Congress to Be Held in Rio de Janeiro

WITH THE STATEMENT that, "Engineering in the Americas today needs a 'town meeting' for the expression of its common points of view, for the unification of its plans, for the joint study of the great problems that confront it—problems which relate to the general welfare and to peace among nations—and for the achievement of personal contact and direct links among the engineers of the American community, for which nothing can substitute," F. Saturnino de Brito, president of the South American Union of Engineering Associations (USAI), announces the first Pan-American Engineering Congress. To be held in Rio de Janeiro, Brazil, July 15 to 24, the Congress will be preceded by a meeting of engineers in Sao Paulo from July 9 to 13.

To make the congress as widely helpful as possible and to emphasize the service that the engineering profession can render to the Americas, the technical agenda will cover the principal engineering fields. There will be papers on the numerous phases of transportation, communications, construction, power, urban and rural engineering, sanitation, industrial engineering, mining, and engineering teaching.

ASCE is in sympathy with the objectives of the proposed Congress, despite the fact that it will conflict with the dates set for the Society's Annual Convention in Mexico City, July 13–16. Several ASCE members as well as members of other EJC constituent organizations have signified their intention to prepare papers. Officials of the Congress indicate that it is not necessary for authors of accepted papers to deliver them in person. Papers for consideration should be submitted to Engineers Joint Council, 29 West 39th Street, New York 18, N.Y., by April 30.

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Local Section Committee to Advise on City Zoning

AN ADVISORY COMMITTEE has been named by the Metropolitan Section of ASCE to cooperate with the City Plan Commission on the rezoning of New York City. The committee, appointed at the request of the Commissioner, consists of Harold M. Lewis, chairman, Ford Bartlett, George A. Schiller, Leslie Williams, and E. P. Goodrich.

California Sections to Hear ASCE President and Secretary at Joint Conference

LEADING SPEAKERS AT the Second Annual California Conference of Local Sections, to be held at the U. S. Grant Hotel in San Diego, March 25–26, will be ASCE President Franklin Thomas, who will discuss "Widening Horizons of the Engineering Profession," at the Friday dinner, and Executive Secretary William N. Carey, whose topic will be "Engineers and Their Societies."

Projects of special interest to California engineers will be discussed during the two-day technical program, which is featuring papers on "The High-Rate Activated Sludge Plant for the City of Los Angeles," by Merrill Butler, deputy engineer for the city; the state freeway plan, by Fred Grumm, deputy state highway engineer for the California Division of Highways; and "Current Steam Plant Construction Projects of the Pacific Gas and Electric Company," by I. C. Steele, vice-president and chief engineer of the P. G. & E. Co.

Special events include a pre-convention get-together in the Gold Room of the U. S. Grant Hotel on Thursday evening; a Friday luncheon, at which Harley Knox, mayor of San Diego, and Section President Richard S. Holmgren will speak briefly; a Student Chapter paper competition on Friday afternoon; and the Friday dinner dance, featuring talks by President Thomas and Secretary Carey and presentation of the two prize-winning student papers selected in the afternoon competition.

The ladies will be entertained on Friday with late-morning brunch at the El Cortez Hotel, followed by an automobile trip across the bay by ferry, a visit to the famous Hotel del Coronado, and continuation of the motor trip to Tijuana, Mexico. There will be opportunities for shopping and sightseeing in Tijuana, and a Mexican tea will be served before the return trip. Later the ladies will join the engineers for an informal cocktail hour and the dinner dance.

Numerous sightseeing trips will be available on Saturday, following a morning business meeting, with special interest centering about a harbor excursion by boat with luncheon served aboard. A deep-sea fishing trip to Coronado Islands has been arranged for very early Sunday morning. Plans have also been made for an all-day golf tournament at Rancho Santa Fe and a model yacht race at Mission Bay on Sunday.

Reservations for rooms should be made direct to the U. S. Grant Hotel. Other inquiries may be addressed to Mr. Phil W. Helsley, convention secretary, San Diego Testing Laboratory, Administration Building, Balboa Park, San Diego 1, Calif.

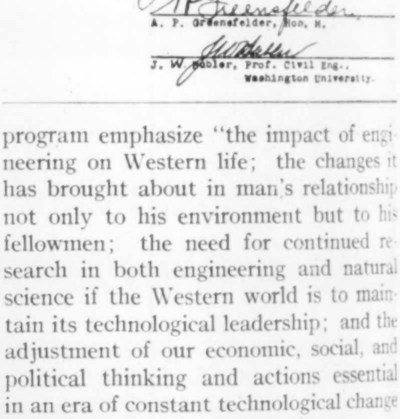
Groups participating in the conference are the four California Local Sections—Los Angeles, Sacramento, San Diego, and San Francisco—and their seven sponsored Student Chapters at the Universities of California, Southern California, Nevada, Stanford, and Santa Clara, the San Diego Branch of the University of California, and the California Institute of Technology.

AERIAL PHOTO SHOWS business area of Oklahoma City, locale of ASCE Spring Meeting, April 20–23. Full meeting program is printed on pages 13–17.

Centennial Celebration Is Planned by ASCE

AT RECENT MEETINGS of the ASCE Centennial Committee, appointed by the President in August 1948, tentative plans for the Society's centennial celebration in 1952 were formulated.

Recommending that the theme of the meeting be, "A Century of Engineering Progress, Its Material Accomplishments and Its Economic and Social Implications," the committee suggests that the program emphasize "the impact of engineering on Western life; the changes it has brought about in man's relationship not only to his environment but to his fellowmen; the need for continued research in both engineering and natural science if the Western world is to maintain its technological leadership; and the adjustment of our economic, social, and political thinking and actions essential in an era of constant technological change and progress."



New York, N. Y.
January 20, 1949.

Mr. Wm. N. Carey
Executive Secretary
A. S. C. E.

Subject: A. S. C. E.
CENTENNIAL FUND
1952

Sir:

Mindful of the approaching centennial of the Society, and doubtless the desire to recognize nation-wide the achievements of Civil Engineers, through a "CIVIL ENGINEERING WEEK" and the publication and distribution to public officials, libraries and colleges of a century review of the relation of CIVIL Engineers to CIVILization, or other appropriate measures; and

Mindful of the need for a special CENTENNIAL FUND of FIFTY-TWO Thousand Dollars or more to defray the nonrecurrent expenses of a Centennial program worthy of the Society, the representatives of the St. Louis Section of the Society present at this Annual Meeting pledge the underwriting by that Section of One Thousand ($1,000.00) Dollars to initiate that National Fund as a small token of their appreciation of the splendid endeavors in its behalf of the National Society.

Respectfully,

W. W. Horner
W. W. Horner, Past President

Robert B. Brooks
Robert B. Brooks, Vice-President

John I. Parcel
John I. Parcel, Past Chr. St. Louis Sec.

A. P. Greensfelder
A. P. Greensfelder, Hon. M.

J. W. Hubler, Prof. Civil Eng.,
Washington University.

To implement this program, the committee recommends enlisting the cooperation of the other Founder Societies and the American Institute of Chemical Engineers and the American Institute of Architects. Over-all control of activities and programs would rest with the ASCE Anniversary Committee. Present plans call for a full-week meeting, to be held at Columbia University early in September 1952.

Stating that such a celebration will be costly and that it cannot be financed from usual ASCE sources, the committee declares that the proposed meeting, "devoted to basic problems of civilization, should and could secure adequate financial and other support from many outside sources. We have in mind not only federal, state and municipal interests, American business and industries, but also important foundations devoted to the public welfare." In a letter sent to the Executive Secretary of the Society on January 20, the St. Louis Section established a centennial celebration fund with a gift of $1,000 (facsimile of letter, p. 50).

The ASCE Centennial Committee consists of Past-President Malcolm Pirnie, chairman, Irving V. A. Huie, vice-chairman, James K. Finch, Dean G. Edwards, Maurice Quade, Edward J. Cleary, Alfred Hedefine, Director William M. Griffin, and Enoch R. Needles.

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Plowing in the Profits

It is not uncommon in Local Section discussions of Society finances to ask, "When is Civil Engineering going to get in the black?" This question arises because the form in which the Society's financial statement is cast does not credit any part of a member's dues to the income of this operation.

An appraisal of the finances of this publication by members should begin with a rereading of the subscription rates, which appear on the lower left-hand corner of the index page:

> Subscription Rates
>
> Price 50 cents a copy; **$5.00 a year in advance; $4.00 a year to members and to libraries; and $2.50 a year to members of Student Chapters. Canadian postage 75 cents and foreign postage $1.50 additional.**

These data, together with figures taken from the Report of the Secretary to the Board of Direction for the fiscal year ending September 30, 1948, would develop the figures shown below.

Net profit—an item stockholders in a business corporation are interested in—was $56,434 for the fiscal year's operations if Civil Engineering were credited with its stated subscription price. Divided among the stockholders, in this case the members of the ASCE, the dividend on this operation of the Society figures out at $2.67 per member.

With these subscriptions included in any consideration of the operations of Civil Engineering as a business venture, the operation has been in the black for a number of years. These profits are ploughed back into other services to members.

CIVIL ENGINEERING

Receipts		Expenditures		
Subscriptions:		Production:		
Members at $4	$84,440	Printing	$45,592	
Non-members at $2.50 and $5	11,226	Paper	30,690	
Advertising	129,667	Postage & mailing	9,163	
		Engravings	9,097	
		Promotion	17,491	
		Salaries	52,133	$164,166
		Rent		3,975
		Telephone & Telegraph		758
Total	$225,333	Total		$168,899

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EJC Legislative Panel Recommends Keeping Professional Provisions in Labor Law

Retention of the Taft-Hartley Law definition of professional employees and provisions distinguishing them from non-professionals was urged at a hearing of the Senate Committee on Labor and Public Welfare on February 14 by a panel representing more than 100,000 engineers.

Pointing out that the present law for the first time defines professional employees and gives them statutory protection instead of making them subject to National Labor Relations Board interpretations, as was the case under the Wagner Act, the panel told the Senators: "There has been a distinct trend away from earlier unsatisfactory conditions and we are well on the way toward complete abolishment of the confusion and distress that existed among professional employees under the earlier law."

The panel was sponsored by Engineers Joint Council—made up of the American Society of Civil Engineers, American Institute of Mining and Metallurgical Engineers, The American Society of Mechanical Engineers, American Institute of Electrical Engineers, and American Institute of Chemical Engineers—and included representatives of two other engineering organizations, the American Society for Engineering Education and the National Society of Professional Engineers. E. Lawrence Chandler, Assistant Secretary of the American Society of Civil Engineers, made the presentation as chairman of the panel which consists of the following: AIChE, represented by W. I. Burt, vice-president, B. F. Goodrich Chemical Co., Cleveland, Ohio; AIEE, by E. H. Bancker, application engineer, General Electric Co., Schenectady, N.Y.; AIME, by Francis B. Foley, superintendent of research, the Midvale Co., Philadelphia, Pa.; ASEE, by Harry S. Rogers, president, Brooklyn Polytechnic Institute, Brooklyn, N.Y.; ASCE, by Gail A. Hathaway, special assistant to the Chief of Engineers, War Department, Washington, D.C.; ASME by William F. Ryan, engineering manager, Stone & Webster Engineering Corp., Boston, Mass.; and NSPE, by J. S. Kennedy, Portland Cement Association, Cleveland, Ohio.

Citing cases decided both under the Wagner Act and the Taft-Hartley Law, the engineers declared:

"A fundamental difficulty with the Wagner Act, as it affected professional employees, was that no distinction was made between professional and non-professional employees in spite of the facts that their viewpoints and abilities are inherently different and that their conditions of employment cannot be made subject to a common standard. There is no yardstick by which creative ability can be measured. To attempt application of the same standard of measurement for services of professional men and non-professional men is not in the public interest. The output of professional employees cannot be standardized as can that of manual and skilled labor. It cannot be measured in terms such as the number of brick a man should lay in a given number of hours, the number of cubic yards of dirt that should be moved, the square yards of painting, the amount of type to be set, bolts to be placed, feet of conduit to be laid, or in terms of any other similar unit.

"In spite of all this, prior to enactment of the present law, professional employees often were included against their will in heterogeneous groups and compelled to accept representation which they did not desire in collective bargaining procedure. The results were most unsatisfactory. There was serious effect on the morale of professional employees, and generally poor relationships developed between those employees and labor unions and employers. Even though the votes of the professional employees were unanimous against proposed representation, it was of no avail. By sheer numerical force the professional employees were denied effective representation."

Accepting the principle of collective bargaining as a "right of employees, professional and non-professional," the engineers asserted:

"It is futile to expect that a forced grouping of professional and non-professional employees could possibly form an 'appropriate bargaining unit.' Under the old law and its administration, such plainly inappropriate groupings were made and, by fiat, were declared appropriate."

John L. Savage, Hon. M., Wins Washington Award

This year's recipient of the Washington Award, joint award of the Four Founder Societies and the Western Society of Engineers, is ASCE Honorary Member John L. Savage, who has achieved world fame as designer of great engineering projects.

J. L. Savage

As chief designing engineer for the Bureau of Reclamation since 1924, Mr. Savage has been engaged on such works as Hoover, Grand Coulee, and Shasta dams, the All-American Canal, and many other projects. He has also been loaned by the Bureau to the Tennessee Valley Authority, the Panama Canal, and the State Department. As a specialist under the State Department's Cultural Cooperation Program, Mr. Savage outlined plans for the development of water resources in India, Palestine, and many other countries.

Founded in 1916 by John W. Alvord, Hon. M. ASCE, the Washington Award is given annually for "accomplishments which preeminently promote the happiness, comfort, and well-being of humanity." Presentation of the award to Mr. Savage will be made on April 20 in Chicago at a dinner of the Western Society of Engineers, which administers the award.

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Society Officers Honor Past-President Tuttle

At a dinner meeting of present and former ASCE officers, held in New York City during the recent Annual Meeting, a telegram was sent to Past-President and Honorary Member Arthur S. Tuttle, New York City consultant, who was ill and unable to attend. The message stated in part: "We all stood to unite in extending our heartiest good wishes, our regrets that you cannot be with us, and our sincere hopes for your speedy and complete recovery."

A veteran member of the ASCE, Mr. Tuttle is fourth on the list of oldest members in point of connection with the Society, having joined as a Junior in 1887. He has the further distinction of having served the Society in every office except that of Secretary. He was Director from 1914 to 1916; Treasurer in 1919 and 1920; Vice-President in 1932 and 1933; and President in 1935. A full member since 1898, he was elected to Honorary Membership in 1938.

Engineers Joint Council Recommends Approval of Constitution

Concurrence of the representatives of all constituent societies on a draft of a constitution for Engineers Joint Council was reported at a meeting of EJC on February 7. The proposed constitution has been referred back to the five participating societies, with an EJC recommendation that each officially approve the document.

R. E. Dougherty, 1948 President of ASCE, was elected president of Engineers Joint Council, and William N. Carey, Executive Secretary ASCE, was elected secretary. Scott Turner, past-president, AIME, was elected vice-president, and E. L. Chandler, Assistant Secretary ASCE, was reelected treasurer.

Proposed legislation connected with the reorganization of the Army was discussed, with Secretary Carey reporting that the ASCE Board of Direction will make every effort to maintain and improve the professional status of engineers in military service, including the Reserve and National Guard. The ASCE recommendation that EJC take similar steps was referred to the Engineers Joint Council Committee on National Military Establishment.

The draft of the EJC Constitution, which the constituent societies have been asked to approve, follows:

CONSTITUTION OF ENGINEERS JOINT COUNCIL

Article I—Name and Objectives

1. The name of this organization shall be ENGINEERS JOINT COUNCIL.

2. The objectives of the Council shall be:

(*a*) To advance the general welfare of mankind through the available resources and creative ability of the engineering profession.

(*b*) To promote cooperation among the various branches of the engineering profession.

(*c*) To develop sound public policies respecting national and international affairs wherein the engineering profession can be helpful through the services of the members of the engineering profession.

3. To achieve these objectives, the Council shall:

(*a*) Act as an advisory and coordinating agency to seek and study matters of mutual interest to the constituent societies of Council and to recommend parallel action by them.

(*b*) Represent the constituent societies of the Council in instances in which constituent societies deem such joint representation to be desirable.

(*c*) Administer on behalf of the engineering profession, those activities authorized by a majority of the constituent societies of the Council.

Article II—Membership

1. (*a*) The Council shall comprise the two most recent available past-presidents and the secretaries of the constituent societies of Council. Availability of past-presidents shall be determined by the constituent society that they are to represent. Should any constituent society determine that its past-presidents are not available for assignment to EJC, the governing body of such constituent society shall appoint a representative to serve as a member of EJC.

(*b*) The President of each constituent society shall be ex-officio, a member of Council and shall be expected to attend all meetings with all privileges except that of voting unless serving as an official alternate.

(*c*) Each constituent society shall appoint an official alternate from the membership of its governing board, who shall act as a member of Council, with full privileges, when any member of Council, representing his constituent society is absent from Council meetings; when not substituting for an absent member he shall have privileges without vote, and shall be expected to attend all meetings of Council.

(*d*) The representatives and alternates of constituent societies shall serve for the calendar year.

2. The constituent societies of the Council shall be:

The American Society of Civil Engineers
American Institute of Mining and Metallurgical Engineers
The American Society of Mechanical Engineers
American Institute of Electrical Engineers
American Institute of Chemical Engineers

3. A national engineering society may become a constituent society of the Council upon proof that the qualifications required of its members classify them as constituting a generally recognized branch or group of the engineering profession and upon not less than a two-thirds affirmative vote of such constituent societies of the Council. Any member society of EJC may resign from membership upon a 90-day written notice to the secretary of EJC.

Article III—Officers

The officers of the Council shall be a President, a Vice-President, a Secretary and a Treasurer.

Officers of the Council and their terms of office shall be determined in the following manner:

(*a*) *President*—The President of the Council shall be the most recent available Past-President or official representative of a constituent society of Council. The President of the Council preferably shall be selected from the constituent societies in rotation, and in the order named in Article II, Section 2.

The term of office of President of the Council shall be one year, and he shall assume office as of January 1st of each year.

(*b*) *Vice-President*—The Vice-President of the Council shall be the most recent available Past-President or official representative of the constituent society of the Council that will provide the President of Council in the following year.

The term of office of Vice-President shall be one year and he shall assume office as of January 1st of each year.

(*c*) *Secretary*—The Secretary of the Council shall be selected and his term of office shall be as provided in the By-Laws.

(*d*) *Treasurer*—The Treasurer of the Council shall be selected and his term of office shall be provided in the By-Laws.

Article IV—Finances

1. The Council shall maintain a treasury, into which shall be deposited all income received from any and all sources by the Council. Funds of the Council may be derived from any source approved by the Council including financial support by the constituent societies of the Council.

2. Financial support by the constituent societies shall be divided proportionately between said societies on the basis of dues income from members. For the purpose of determining the basis of such proportionate financial support, the Council shall use from time to time, the ratio of dues income of constituent societies for their respective fiscal years last ended at the time of such determination.

3. Financial support by the constituent societies shall be for specific purposes or activities recommended by a majority of the Council. Any society not electing to contribute to any specific activity for which a part of such financial support is to be made shall not be required to participate in the cost of such part thereof; and in such event, the ratio of financial support shall be revised in accordance with the dues income of the constituent societies participating in such specific activity.

Article V—Committees

1. *Executive Committee*—There shall be an Executive Committee, consisting of the President of the Council as Chairman, and the most recent available Past-President of each of the other constituent societies.

The Executive Committee shall be authorized to transact, during interim periods between Council meetings, any business consistent with established policy or procedure of the Council.

2. *Committee on Constitution and By-Laws*—The Council shall appoint a Committee on Constitution and By-Laws which shall study, report, and recommend with respect to revisions and amendments of the Council's Constitution and By-Laws.

3. *Other Committees*—The Council shall authorize and appoint all necessary committees to carry out the objectives of Council, utilizing members of the constituent societies and, in addition thereto, members of other societies or persons who are not engineers.

Article VI—Amendments

1. This Constitution may be amended by an affirmative vote of the governing boards of not less than two-thirds of the constituent societies.

Article VII—Quorum

1. A majority of the membership of the Council, representing not less than two-thirds of the constituent societies, shall constitute a quorum.

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J. H. Ehlers to Represent Society in Washington

Joseph H. Ehlers

Joseph H. Ehlers, a practicing attorney and engineer, has been retained to serve part time as Washington Representative of the Society. Mr. Ehlers, a civil engineering graduate of the University of California and Cornell, formerly served as an adviser to the Chinese Government and to the U. S. Department of Commerce in connection with earthquake reconstruction and industrial development in Japan, and was a committee member of, and delegate to, the First World Engineering Congress in Tokyo in 1929. He was technical director of the National Conference on Construction in Washington and more recently chief of the consulting engineering division of the Federal Works Agency. At present he is serving on the Washington Task Force of the National Engineers Committee of EJC and on the Committee on International Law of the District of Columbia Bar Association.

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R. H. Thomson, Hon. M., and Former Officer, Dies

R. H. Thomson

Honorary Member Reginald Heber Thomson, long active in the Society and in the engineering development of the State of Washington, died at his home in Seattle on January 7, after a brief illness, He was 92. Despite his advanced age. Mr. Thomson attended the Society's 1948 Summer Convention in Seattle and spoke briefly.

Born in Hanover, Ind., Mr. Thomson had lived in Seattle since 1881. As city engineer from 1892 until 1911, he initiated and carried through a number of improvement projects. He resigned as city engineer to organize the Port of Seattle, established by the state legislature largely through his efforts. In 1930 he returned to the city engineer's office for a year to complete final work on the Diablo Dam.

Mr. Thomson was an early advocate of the construction of Mud Mountain Dam, and consulting engineer on construction of the Lake Washington Pontoon Bridge and the foundations of the Tacoma Narrows Bridge. Active in civic affairs, he was a member of the city council from 1916 to 1921 and president of the University of Washington's board of managers from 1905 to 1915.

A full member of the ASCE since 1903, Mr. Thomson served a term as Director from 1917 to 1919, and he was elected Honorary Member in 1940. He was also a past-president of the Pacific Northwest Society of Civil Engineers and a life member of the Canadian Institute of Civil Engineers.

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Lapel Pin Authorized by Board of Direction

As announced in the Secretary's abstract of Board action at the Annual Meeting, in the February issue, a small Society emblem suitable for lapel wear was authorized for corporate members for addition to the approved Society jewelry. The new lapel pin, shown here, is a small blue shield $^3/_8$ in. high with buttonhole fastener.

An order blank for purchasing the pin, which sells for $4, is provided on page 78 of the advertising department.

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Reinstatements and Resignations Listed

With discontinuance of the publication of membership applications, additions, and transfers in Civil Engineering, by recent action of the ASCE Board of Direction, reinstatements and resignations are being published in "Society News." The current list follows:

Reinstatements

Bliss, Thomas Francis, Jun., 1579 Metropolitan Ave., New York, N. Y., reinstated Feb. 1, 1949.

Campbell, Robert Lee, Jun., Civ. Engr., The Texas Co., P.O. Box 509 (Res., 125 East Main St.), Beacon, N. Y., reinstated Jan. 1, 1949.

Colby, Leslie Eldridge, Jun., 3948 Goodland Ave., North Hollywood, Calif., reinstated Feb. 1, 1949.

Graham, Harry Edward, Assoc. M., Struct. Engr., Care, H. K. Ferguson Co., 1 Main St., Houston, Tex., reinstated Jan. 1, 1949.

Leroy, James Milton, Jun., Lt. Comdr., U.S.N.R., 5802 Pine Lane, S.E., Washington, D.C., reinstated Feb. 1, 1949.

Rider, Edwin B., Assoc. M., 3120 St. Paul St., Apts. 408-D, Baltimore, Md., reinstated Jan. 1, 1949.

Theimer, Otto F., M., Dr., 37 Wilbrechtstrasse, Muenchen-Solin, Munich, Germany, U.S. Zone, restored to active membership Jan. 1, 1949.

Vandegrift, Louis Edmond, Assoc. M., 6889 Olentangy River Rd., Worthington, Ohio, reinstated Jan. 1, 1949.

Weiss, Harold, Jun., Hydr. Engr., Southern Calif. Edison Co., 451 South Boylston (Res., 352 No. Genesee Ave.), Los Angeles, Calif., reinstated Jan. 1, 1949.

Wilson, Maybin Holmes, M., Mil. Dept., Univ. of Texas, Austin, Tex., reinstated Jan. 1, 1949.

TOTAL MEMBERSHIP AS OF FEBRUARY 10, 1949

Members	7,251
Associate Members	9,384
Corporate Members	16,635
Honorary Members	44
Juniors	8,289
Affiliates	72
Fellows	1
Total	25,041
(February 9, 1948	22,790)

Resignations

Acree, George, Assoc. M., Chf. Draftsman, Howard, Needles, Tammen & Bergendoff, 921 Walnut St., Kansas City, Mo., resigned Jan. 18, 1949.

Askew. David Hearn, Assoc. M., Senior Des. Engr, State Highway Dept., Austin, Tex., resigned Jan. 18, 1949.

Carrel, Clark Melvin, Assoc. M., 2158 Crary Ave., Altadena, Calif., resigned Jan. 14, 1949.

Cormack, Bruce Logue, Jun., With Research Div., United Shoe Machinery Corp., 140 Federal St., Boston (Res., 83 Egmont St., Brookline), Mass., resigned Jan. 1, 1949.

Dashiell, Robert Freeland, Jun., Civ. Engr., Duncanson-Harrelson, 690 Market St., San Francisco (Res., 1207 B University Ave., Berkeley), Calif., resigned Jan. 27, 1949.

Fales, John Chester, Assoc. M., Engr. (Civ.), Naval Air Station, Alemeda (Res., 2624 Que St., Sacramento), Calif., resigned Jan. 18, 1949.

Fee, John Mackey, Jr., Jun., Asst. Highway Engr. (Trainee), State Highway Dept., 213 Smith St., Perth Amboy (Res., 155 Main St., South River), N. J., resigned Jan. 28, 1949.

Friedman, Harold U., Jun., With David B. Steinman, Cons. Engr., 17 Liberty St., New York (Res., 1016 Fiftieth St., Brooklyn), N. Y., resigned Jan. 18, 1949.

Hanson, Arthur Henry, Assoc. M., Comdr., CEC, U.S.N., Public Works Dept., Naval Ammunition Depot, Hastings, Nebr., resigned Jan. 17, 1949.

Hinton, Julian Pitts, Jun., Hydr. Engr., Tennessee Valley Authority, 501 Union Bldg., Knoxville, Tenn., resigned Jan. 27, 1949.

Kneale, John Stephen, Jr., Jun., Estimator (San. Engr.), The Permutitt Co., 517 Hamilton National Bank Bldg., Chattanooga, Tenn., resigned Feb. 1, 1949.

Kneeland, William Frederick, Jun., With Eng. Dept., Aluminum Co. of America, West Fabricating Plant, Alcoa (Res., Virginia Apts., Stanley St., Maryville), Tenn., resigned Jan. 14, 1949.

Koblanski, Michael George, Jun., Student, Columbia Univ., New York, N.Y. (Res., 94 Stevens Ave., Jersey City, N. J.), resigned Jan. 18, 1949.

Lefevre, William Douglas, Assoc. M., Junior Highway Engr., State Roads Comm., Calvert & Lexington Sts., Baltimore (Res., Chesapeake City, Cecil County), Md., resigned Jan. 27, 1949.

Leonard, James Joseph, Jun., Draftsman, Brewster Aeronautics Corp., Long Island City (Res., 265 East 181st St., New York), N. Y., resigned Jan. 17, 1949.

Lowey, Leslie Lawrence, Assoc. M., Engr. and Builder, 43–24 Forty-third St., Long Island, N.Y., resigned Dec. 31, 1948.

Mark, Donald William, Jun., Constr. Engr., Veteran's Administration, Fort Snelling (Res., 1484 Summit Ave., St. Paul), Minn., resigned Jan. 18, 1949.

Mathewson, Preston Daniel, Jr., Jun., R.T. 3/c, R.T., U.S.N., 157 Ocean Ave., Edgewood, R.I., resigned Jan. 14, 1949.

Maxson, Robert Orville, Jun., Topographic Engr., U. S. Geological Survey, F.W.A. Bldg., Washington, D.C. (Res., 4832 No. Fairfax Dr., Arlington, Va.), resigned Jan. 14, 1949.

Nelson, George A., Assoc. M., Engr., General U.S. Navy, Bureau of Yards & Docks (Res., 5807 Namadagan Rd.), Washington, D.C., resigned Jan. 18, 1949.

Olson, Gordon Axel, Jun., Research Engr., Cornell Aeronautical Laboratory, Buffalo (Res., 123 Springville Ave., Eggertsville), N.Y., resigned Feb. 1, 1949.

Person, Kenneth William, Jun., Supt. of Distribution, Minneapolis Gas & Light Co., 1025 Broadway, Minneapolis, Minn., resigned Jan. 17, 1949.

Pierce, Franklin Kelley, Jun., Special Agent, U.S. Dept. of Justice, Federal Bureau of Investigation, Washington, D.C.; 607 U.S. Court House, Foley Sq., New York, N.Y., resigned Feb. 1, 1949.

Pittman, Everette Edward, M., Senior Des. Engr., State Highway Dept. (Res., 2821 Salado St.), Austin, Tex., resigned Jan. 27, 1949.

Scherr, Michael, Assoc. M., Asst. Civ. Engr., Board of Water Supply, 120 Wall St., New York (Res., 531 Montgomery St., Brooklyn), N.Y., resigned Jan. 18, 1949.

Sims, George Chester, Jun., Lt. Col., U.S.A., Box 52, Douglas, Wyo., resigned Jan. 18, 1949.

Stephenson, Junius Winfield, Jun., Asst. Design Engr., Havens & Emerson, 233 Broadway, New York, N. Y., resigned Jan. 31, 1949.

Stewart, Douglas Hamilton, Jun., City Engr., Thief River Falls, Minn., resigned Jan. 17, 1949.

Styer, Wilhelm Delp, M., Lt. Gen., Corps of Engrs. U.S.A., Coronado, San Diego County, Calif., resigned Jan. 14, 1949.

Valente, George Anthony, Assoc. M., Constr. Engr., George M. Brewster & Sons, Gen. Contrs. Bogota (Res., 25 Gould Pl., Caldwell), N. J., resigned Feb. 1, 1949.

Wells, George Stanley, Assoc. M., 2 Christchurch Crescent, Radlett, Hertfordshire, England, resigned Jan. 14, 1949.

Winkler, John Robert, Jun., Asst. Engr., Arms & Ammunitions Div., Ordnance Bureau, War Dept. Aberdeen Proving Ground (Res., 36 Liberty St., Aberdeen), Md., resigned Feb. 1, 1949.

Zidel, Mischel, Jun. Engr., Control Valley Project, U.S. Bureau of Reclamation, Redding, Calif. resigned Jan. 17, 1949.

New Life Members Express Appreciation of Society

Gratitude for the benefits of long association with the Society is the dominant note of letters received at ASCE Headquarters from a number of the 211 engineers who became life members on January 1. Many of these new life members, writing in response to letters from the Executive Secretary congratulating them on their eligibility to receive the certificates of life membership and to enjoy the accompanying dues-exempt status, also express the determination to continue to serve the Society and the profession. Still others express regret for opportunities for service neglected.

Typical of the many letters received are the following excerpts:

"In looking back over the years I am afraid I shall have to confess that the Society has done more for me than I have for the Society. However, I can assure you that my affiliation with the Society—the contacts it has brought me, its publications, and the splendid men I have met in its membership—has been of inestimable aid and inspiration to me."

"I thoroughly appreciate what you have written. As a member who voted in favor of increasing the dues, I have been remitting the additional amount, and shall continue sending this small increase."

"Your letter advising me of my eligibility for life membership at the beginning of 1949 was a pleasant reminder that even for civil engineers, 'Time Marches On.' Many pleasant memories exist from my association with the various members of the Society and the honors bestowed upon me."

"I fear I have not been of much aid to our Society. It is I who owe gratitude for the great privilege of membership, and the friends I have made in consequence."

"To be included with those members of the Society who have done so much more than I in the molding of so strong a professional organization, one of which we are proud, causes me to reflect, and I then realize my unworthiness."

"From early college days it was my

New Life Members Added to ASCE Rolls on January 1, 1949

Milton Jewell Adams
Langford Taylor Alden
Frederick Webber Amadon
John Flinn Ancona
Horace Francis Anthony
George Simpson Armstrong
John Ayer
Boris Alexandrowitch Bakhmeteff
William Earnest Baldry
Frank Neal Baldwin
Frederic Arthur Batty
Walter Samuel Baver
Sydney Raymond Bellows
Odin Baltimore Bestor
George Washington Biggs, Jr.
John William Bernard Blackman
Clifford Holmes Boardman
Nathan Abbott Bowers
William Brewster
John Nixon Brooks
Archibald Alexander Brown
Otto George Henry Buettner
Cecil Spencer Bumann
Arthur William Bushell
Clifton O'Neal Carey
Arthur Adam Augustine Carman
J C Carpenter
John Bow Challies
Edward North Chisolm
Elihu Church
Elmer White Clark
Ernest Albert Cleveland
William Gideon Closson
Jeremiah Joseph Collins
Carlton Nudd Conner
Orrin Fulton Cooley
Charles Brown Cornell
Ernest Brown Coulson
Ernest Buchanan Crane
William Harrison Crawford
Howard Thompson Critchlow
Charles William Cubbage
Frank Ezekiel Cudworth
John Wilbur Cunningham
Leon George Cutler
Roland Parker Davis
Donald Derickson
Fred Otis Dolson
Frank Young Dorrance
Frank Doughty
Torris Eide
Tazewell Ellett
Earl Conarroe Elliott
George Henry Ellis
Andrew Travers Ewell
William Patrick Feeley
Leon Fleischmann
James McCardell Fourmy
James Duncan Fowler
Howard Howell George
Chester Gordon Gillespie
Maurice Eugene Gilmore
John Henry Glander
Albert Theodore Goldbeck
Ralph Dickinson Goodrich
Edward Theodore Grandlienard
Clarence Jasper Green
Louis Alfred Greenley
Trygve Daniel Bödtker Groner
William Norman Hall
Edward Parmelee Hamilton
William Edward Hamilton
Manton Hannah
Arthur William Harrington
Harry Fallon Harris
Tom Hind Hudson Harrod
Oliver Whitcomb Hartwell
Guy Wilfrid Hayler
John Jacob Heilman
Alfred Brackenridge Heiser
Seward Daniel Hendricks
Ray Kingsbury Holland
Alva Earl Home
Andrew Pearson Hoover
Charles Archer Hopkins
William Offutt Houston
Cyrus Pierce Howes
Louis Richard Howson
Edward Marshall Hunt
Horace Sinclair Hunt
John Rudolph Iakisch
John Monroe Johnson
Theodore Sedgwick Johnson
Benjamin Earl Jones
Sargent Felix Jones
Leonard Crouch Jordan
Walter Edward Joyce
Walter John Kackley
Frank B Kendall
Charles Paul Keyser
Henry Ray Kingsley
Raymond Brown Kittredge
Eugen Frederick Kriegsman
Leander Larson
Michael Nikanorovitch Lebedeff
Oliver Yeaton Leonard
Charles Wells Linsley
Thomas Edwin Linten
Clarence Edward Long
David Lowensohn
Paul Wardlaw Mack
William Ray McCann
Edward Herbert McConnell
Thomas Maddock
James Walter Martin
Leon Waddell Mashburn
Charles Edward Maxfield
Ralph Inman Meeker
Dalton Moomaw
James Daniel Mortimer
Gonzalo Claudio Muñoz
William Henry Nalder
Alfred Worcester Nordwell
Kenneth Howard Osborn
Clarence Bristol Osborne
Horace Whitcomb Oxnard
James Elwood Payne
Thomas Pealer
Lynn Perry
Charles Wesley Petit
Clifford French Phillips
Frederick Henry Pond
George Wesley Pracy
Charles Frederick Puff, Jr.
Carl Roy Rankin
John Charles Rathbun
William Adolph Rathmann
Victor Hugo Reichelt
William Reinhardt
Martin John Reinhart
John Clement Remington, Jr.
Gustav Jaeger Requardt
James Rush Rhyne
Arthur Richards
Charles Germane Richardson
Harold Hansard Robertson
Arthur Johnson Sackett
Erastus Root St. John
Walter Sherman St. John
Edward Haynes Sargent
Herman Schove Schick
Howard French Schryver
Clarence Edmund Seage
Walter Sebastian
George Austin Sherron
Stephen Elliott Shoup
Perry Thomas Simons
Gilbert Small
Harrison Smith
William Henry Smith
Hubert Earl Snyder
Hugo Conrad Soest
Jay La Drew Southworth
Ralph Edgar Spaulding
John Davidson Spinks
Arthur Vall Spinosa
Frank Carter Squire
Frederick Dial Stafford
Ralph William Stewart
William Albert Stinchcomb
Leslie Wrightson Stocker
Thomas Francis Sullivan
Arthur Surveyer
Henry Casper Tammen
Robert Lee Tatum
Samuel Wright Tay
Earle Everett Teeter
William George Boland Thompson
Lesslie Rielle Thomson
Henry Jackson Tippet
William Jacy Titus
Martin Wilhelm Torkelson
Alex M. Torpen
Foster Towle
John Cresson Trautwine, 3d
Alexander Linn Trout
Howard Moore Turner
John Ralph Van Duyne
Harvey Arthur Van Norman
Alfred Van Siller
John Leonard Vogel
Jacob Daniel von Maur
Stephen Francis Voorhees
Newton Benjamin Wade
Harry Bruce Walker
Paul Robert Watson
Ernest Charles Webster
Fredinand J. Weinert
Harry True Welty
Robert Hoadley Whipple
William Monroe White
Gilbert Clinton Whitney
Milton James Whitson
Charles Benson Wigton
Joseph Fremont Wilber
Ernst Victor Willard
Roy Heath Wilson
Russell Sherwood Wise
Benjamin Russell Wood
James Clayton Wright
Francis German Wrightson, Jr.
Gilbert Albin Youngberg

desire and intent to attain membership in the Society, and I could not now consider my career properly realized without such membership. It seems to me every engineer should become a member of, and support, the founder society of his profession."

"While I have never been active in the affairs of the Society, I have always maintained an interest in it, and have considered the right to wear its membership emblem as an honor and a privilege. I have endeavored to conduct all of my engineering activities in accordance with its code and, like many other members of the profession, I can take a great deal of satisfaction from looking back over the things accomplished, the obstacles overcome, and particularly to the many valued friendships among my associates."

"Please give my thanks to the members of the Board of Direction and say that I am still hale and hearty, and if I can serve the Society in any possible way, please call."

"My membership in the ASCE has certainly helped me in all my work. The literature received from the Society has always been a source of inspiration."

"I sincerely appreciate your kind felicitations and hope that I may be of continued service to the Society, and especially to our Local Section."

"The bound volumes of TRANSACTIONS on my library shelves extending from 1914 to date have served me well professionally, yet I realize all too well that I have contributed but little directly to their great worth."

"I sincerely regret that I have contributed so little to an organization, the badge of which I wear with such pride."

"I have no immediate intention of stopping hard work or participation in Society affairs, even with this reminder that time is passing by."

"I have been gratified by the progress made by the Society since I became a member and particularly in the past few years. It used to be known as 'the Old Lady on Fifty-Seventh Street,' and it certainly has changed its ways very much since it had that appellation."

"In view of the insignificant support which I have given in the past, this action of the Society moves me to hope that in the future I may really do something worth while."

"I am highly honored to receive and cherish a life membership, and I wish to reiterate that I will continue as long as I live to do all that I can for such a worthy society."

FOUNDERS
35

SPECIAL INVITATION FROM CITY OF LOS ANGELES to Society to hold 1950 Spring Meeting there is presented to ASCE President Franklin Thomas (right) by Julian Hinds, Los Angeles, Society Director from District 11. Invitation is signed by mayor of city and president of Chamber of Commerce.

NEWS OF LOCAL SECTIONS

Scheduled ASCE Meetings

SPRING MEETING

Oklahoma City, Okla., April 20–22
(Board of Direction meets
April 18–19)

ANNUAL CONVENTION

Mexico City, Mexico, July 13–16
(Board of Direction meets July 11–12)

FALL MEETING

Washington, D.C., November 2–4
(Board of Direction meets
October 31–November 1)

Coming Events

Cleveland—Meeting at the Cleveland Engineering Society, Cleveland, March 18; dinner at 6:30 p.m. and meeting at 8 p.m.

Colorado—Meeting at the Oxford Hotel, Denver, March 14.

District of Columbia—Meeting in the Cosmos Club Auditorium, Washington, D.C., March 8, at 8 p.m.

Kentucky—Meeting in Frankfort on March 18.

Los Angeles—General dinner meeting at Alexandria Hotel, Los Angeles, March 9, at 6:30 p.m. Junior Forum of Los Angeles will meet at Alexandria Hotel, March 9, at 5:30 p.m. Sanitary group meeting at Clark Hotel, March 23. Joint meeting with Hydraulic Division, ASME, in Mechanical Engineering Building, California Institute of Technology, Pasadena, on March 30.

Maryland—Meeting in the Engineers' Club of Baltimore, March 9, at 8 p.m. Preceded by cocktails at 6 p.m. and dinner at 7 p.m.

Metropolitan—Meeting in the Engineering Societies Building on March 16, at 8 p.m. Junior Branch will meet in the Engineering Societies Building on March 9 and 23 at 7:30 p.m. Meetings preceded by dinner in the New York Times Dining Room at 6 p.m.

Northeastern—Meeting in the Campus House, Massachusetts Institute of Technology, Boston, Mass., on March 7.

Northwestern—Dinner meeting at the Coffman Memorial Union, University of Minnesota, Minneapolis, March 7, at 6:30 p.m.

Philadelphia—Meeting at Hotel Rodney, Wilmington, Del., March 8, at 8 p.m. Preceded by cocktails at 6:30 p.m. and dinner at 7 p.m.

Sacramento—Regular luncheon meetings every Tuesday at the Elks Temple, Sacramento, 12:30 p.m.

San Francisco—Weekly luncheon meetings held on Wednesday in the Engineers' Club of San Francisco.

Tennessee Valley—Meeting of the Knoxville Sub-Section on March 9. Smoker-dinner meeting of the Chattanooga Sub-Section at the Hotel Patten, Chattanooga, March 8, at 5:15 p.m.

Tri-City—Dinner meeting in the Rock Island Arsenal Cafeteria, Rock Island, on March 17, at 6:30 p.m.

Virginia—Joint meeting with the Central Virginia Engineers' Club at Ewarts Cafeteria, Richmond, March 18, at 6 p.m.

Recent Activities

AKRON

A RECENT AUTOMOBILE trip on the Alcan Highway was described at the Section's annual meeting by Earl Caves, who showed colored slides illustrating many features of highway and bridge location, construction, and maintenance. During the business session, Martin P. Laeur was elected president for the coming year; Sherman T. Swigart, vice-president; and George S. Long, secretary-treasurer.

CINCINNATI

LATEST DEVELOPMENTS IN structural aluminum were discussed at a recent meeting of the Cincinnati Section by B. J. Fletcher, of the Aluminum Company of America. Mr. Fletcher supplemented his remarks with two informative films on the manufacture and development of aluminum—"Curiosity Shop" and "This Is Aluminum."

CENTRAL ILLINOIS

The various engineering societies must work together for the advancement of the profession, Alex Van Praag, Jr., consulting engineer of Decatur, Ill., and retiring president of the National Society of Professional Engineers, told members of the Central Illinois Section. Speaking on the subject, "How Shall We Solve Our Professional Problems," at a joint dinner meeting of the Section, the University of Illinois Student Chapter, and the Illinois Society of Professional Engineers, Mr. Van Praag emphasized the need for coordinating the activities of professional and technical groups. New Section officers, elected during the meeting, are: Norman H. Gundrum, president; James G. Clark, first vice-president; Ray V. Tilly, second vice-president; and Ellis Danner, secretary-treasurer.

COLORADO

Development of the Bureau of Reclamation's proposed multiple-purpose Blue-South Platte Project to provide water and irrigation for the Denver area was described at a recent dinner meeting by Joseph M. Barrett, planning engineer for the Bureau. The project, which is now being reviewed by state and government agencies, would divert water from the Colorado River watershed to the eastern slope of the Rockies at an estimated cost of $400,000,000. In addition to augmenting present limited supplies of water and electrical energy in the Denver area, Mr. Barrett declared, "the project is vitally important to the expanding agricultural and industrial economy of the upper South Platte River Basin."

DISTRICT OF COLUMBIA

Changes are being introduced into the teaching of engineering because of the changing demands on the profession, ASCE President Franklin Thomas told members of the Section at their annual dinner meeting. Speaking on "Our Changing Profession," President Thomas cited the present-day demand for a broader education in the humanities, which will enable engineering graduates to play a more effective role in community life. In many cases, there will be time to teach only engineering fundamentals in the average four-year course, if the humanities are to receive due recognition, and practice in the fundamentals will have to come after graduation, President Thomas stated. T. Keith Legaré, executive secretary of the National Council of State Boards of Engineering Examiners, also spoke. The attendance of 192 included ASCE Executive Secretary William N. Carey; Assistant Secretary E. L. Chandler; Perley A. Rice, president of the Virginia Section; Gurney H. Dayett, president of the Maryland Section; and E. L. Shoemaker, president of the Philadelphia Section.

CONNECTICUT

In a talk entitled "Exploring the Ocean Bottom," presented at the Section's annual meeting, John B. Lucke, head of the geology and geography department of the University of Connecticut, described the 1948 Mid-Atlantic Ridge Expedition, on the research ship *Atlantis*. The expedition was sponsored by the National Geographic Society, Columbia University, and the Woods Hole Oceanographic Institution. During the program, certificates of life membership were presented to Arthur W. Bushell, Hugo C. Soest, W. G. B. Thompson, and Henry J. Tippett. New Section officers are Frank Ragaini, president; Charles W. Cooke, vice-president; and Robert P. Vreeland, Jr., secretary-treasurer.

GEORGIA

Various phases of the Atlanta and Fulton County proposed expressway system for expediting the flow of traffic through Atlanta were described at the first meeting of the year, on February 4, before a capacity audience that included the mayor and other notables. Col. Mose E. Cox, engineer executive secretary of the Joint Bond Commission on the project, and speaker of the evening, stated that work is now under way on some of the sections, but that from five to ten years will be required to complete the entire project, depending upon the availability of required funds. Officers for 1949 are Thomas H. Evans, president; J. M. Roberts and Raymond J. Gauger, vice-presidents; and R. W. Pierce, secretary-treasurer.

INTERMOUNTAIN

Speakers at a recent meeting of the Intermountain Section were Ray Randall, meteorologist for the U.S. Weather Bureau, who described how weather forecasts are made, and Jack Ahern, who discussed the work of the local aerial photography organization he is connected with. Prof. Harold Carter, chairman of the Section's Legislative Committee, reported the favorable results of a committee call on the new governor regarding the appointment of engineers to public service posts.

IOWA

"Unusual Reinforced Concrete Structures" comprised the topic of discussion at a joint session with the Iowa State College Student Chapter on February 9, which was addressed by H. M. Stoll, regional structural engineer for the Portland Cement Association. The attendance of 108 included 80 students.

KANSAS

Office space and other requirements of the expanding state departments were discussed at a recent meeting by Charles Marshall, state architect. Reporting the result of studies made by the Office Building Commission, Mr. Marshall stated that recommendations call for a new $4,500,000 building to house all departments now outside the Capitol, except the Highway Commission and the Health Laboratory. During the evening a certificate of life membership in the Society was presented to W. E. Baldry. The annual election of officers resulted in the selection of Reed F. Morse as president, and Francis J. Nettleton as vice president. John W. Frazier was reelected secretary-treasurer.

KANSAS CITY

Contrasts between old and new ways in Brazil, especially in the field of transportation, were presented in an illustrated lecture comprising the technical program at a recent meeting, by Frank S. Gilmore, consulting engineer. Mr. Gilmore stated that the means of transportation range from such primitive methods as the human porter and ox cart to the kind of travel permitted by the most modern four-lane concrete highways. Other dramatic contrasts were shown in colored films of native housing and the most modern apartment and office buildings.

LEHIGH VALLEY

Flood control in the Lehigh Valley was discussed at the Section's annual meeting by Col. F. F. Frech, district engineer for the Philadelphia District of the Corps of Engineers. Colonel Frech described the present status of the Lehigh Valley project, which is now in the planning stage, and explained some of the engineering features of the proposed Bear Creek Dam. During the evening the following officers were elected for 1949: E. L. Durkee, president; W. J. Eney, first vice-president; M. O. Fuller, second vice-president; and R. E. Crispen, secretary-treasurer. A founder and charter member of the Section, Professor Fuller has just completed 26 years in the office of secretary-treasurer.

KENTUCKY

Following a luncheon meeting of the Section and the Kentucky Society of Professional Engineers on February 4, the joint group went to Tyrone, Ky., for an inspection tour of the new steam electric generating plant of the Kentucky Utilities Co., in the Kentucky River Valley. Speakers at the luncheon meeting were ASCE Director D. V. Terrell, who commented on current Society activities, and Prof. E. B. Penrod, of the University of Kentucky, who explained the principles and operation of the heat pump. Many Section members attended the evening banquet of the Kentucky Society of Professional Engineers, at which a symposium on the engineering profession in the state was presented by John W. Manning, commissioner of finance; D. H. Bray, state highway engineer; and Director Terrell, dean of the college of engineering at the University of Kentucky.

LOS ANGELES

A panel of student speakers from the University of Southern California Student Chapter presented the program at a recent meeting, at which the Chapter was host to the Section. The program, which was conducted by Jesse Kitchens, Chapter president, included inspection of the engineering buildings on the campus and special demonstrations in the materials, hydraulics, cross-connection, and electrical engineering laboratories.

MARYLAND

In a talk on modern tunnel construction, given at a recent dinner meeting, M. L. MacLean, chief engineer of Samuel R. Rosoff, Ltd., of New York City, covered methods of shafting, drilling, and lining tunnels, temporary shoring and bracing. Mr. MacLean commented particularly on the Baltimore City Water Tunnel, now under construction, and in conclusion showed a colored film of the construction of El Mirador Tunnel in Mexico.

LOUISIANA

Donald Derickson, professor emeritus of civil engineering at Tulane University, was doubly honored at the annual meeting of the Section with the award of both life and honorary memberships in the Society. ASCE President Franklin Thomas, guest of honor and principal speaker, presented the certificate of honorary membership to Professor Derickson, who had been unable to attend the ASCE Annual Meeting in New York where the other honorary membership awards were made. In his address, President Thomas described the prestige of the Society abroad and the significance of its international relationships, referring particularly to the Summer Convention in Mexico City. Professor Thomas spoke, also, of the work of the Society and EJC toward improving the status of the profession through legislative and other channels. Section recipients of life membership, in addition to Professor Derickson, are James M. Fourmy, Sargent F. Jones, R. L. Tatum, and C. W. Cubbage. In the annual election of officers, held during the business session, W. H. Scales became president; Bernhard Dornblatt, first vice-president; E. M. Freeman, second vice-president; and F. W. MacDonald, secretary-treasurer.

METROPOLITAN

New York is in the horse and buggy days as far as its zoning laws are concerned, Robert F. Wagner, Jr., chairman of the City Planning Commission, told members of the Metropolitan Section at their February meeting. Emphasizing the necessity of revising the present laws, Mr. Wagner described some of the problems involved in re-zoning and stated that the City Planning Commission is now conferring with professional and civic groups on possible methods of revision. There was an attendance of 250.

On February 9 members of the Junior Branch saw a sound film, illustrating the construction of highways from the drawing-board stage to the final rolling of vehicles. The film and accompanying talk were presented by Gordon F. Whitney, export manager of Barber-Greene.

MIAMI

Newly elected ASCE Director Edmund Friedman attended the February meeting of the Miami Section and reported the recent meeting of the Board of Direction, commenting particularly on the Society's financial status. During the evening several committee reports were read, and certificates of life membership were presented to A. Travers Ewell and Col. Lynn Perry.

MID-MISSOURI

A general discussion of Society and Section affairs highlighted the Section's annual business meeting. Special attention was given the subject of improving contacts and establishing closer relationships between the Juniors and older members of the Section, and it was decided to appoint a committee of Juniors to make a further study of ways and means. New Section officers are: Dewey Welch, president; A. C. McCutchen, first vice-president; John A. Short, second vice-president; W. J. Schulten, secretary-treasurer; and J. Kent Roberts, Junior director.

NORTHWESTERN

Navy installations and the operation of the Civil Engineer Corps in both war and peace were discussed by Capt. J. F. Jelley, Jr., deputy chief of the Bureau of Yards and Docks, at a joint dinner meeting of the Section and the Twin City Chapter of the Society of American Military Engineers. Col. W. K. Wilson, president of the Society of American Military Engineers, presided. At another recent meeting, the principal speaker was W. B. Irwin, assistant to the vice-president in charge of operations of the Great Northern Railway, whose subject was the Alaska Railway and its place in the development of the territory.

OKLAHOMA

A diverse program of inspection trips, technical papers, and business discussion featured the Section's two-day annual meeting at Bartlesville, Okla. Trips were made to the Petroleum Experiment Station of the U. S. Bureau of Mines, and to the Hulah Dam Project, which was conducted by the Tulsa District of the Corps of Engineers. Technical speakers included Richard N. Kuhlman, associate professor of architecture and associate director of the Institute for Community Development at the University of Oklahoma, who read a paper on "City Planning for Oklahoma," and A. D. Terrell, assistant to the president of the National Zinc Co., who discussed the smelting of zinc. The principal speaker at the annual banquet, which was attended by members of the Bartlesville Engineers Club, was Clark A. Dunn, whose subject was "Engineering in Democracy." During the annual business meeting, J. Ray Matlock was elected president, and Walter C. Burnham, vice-president. ASCE Director Webster L. Benham addressed the session on Society affairs, and David B. Benham, chairman of the Committee on General Arrangements for the Spring Meeting of the Society, to be held in Oklahoma City, outlined his plans for the conduct of the meeting.

PANAMA

Conservation of existing facilities and structures, in the present period of high replacement costs, was discussed at the February meeting by J. P. Noble, chief of the management section of the Office of the Comptroller, U.S. Army, Caribbean, in a talk entitled "The Maintenance Effort." New Panama Section officers are: Tomas Guardia, president; Ernest W. Zelnick, first vice-president; William B. Turpin, second vice-president; and Nelson E. Wise, secretary-treasurer.

PHILADELPHIA

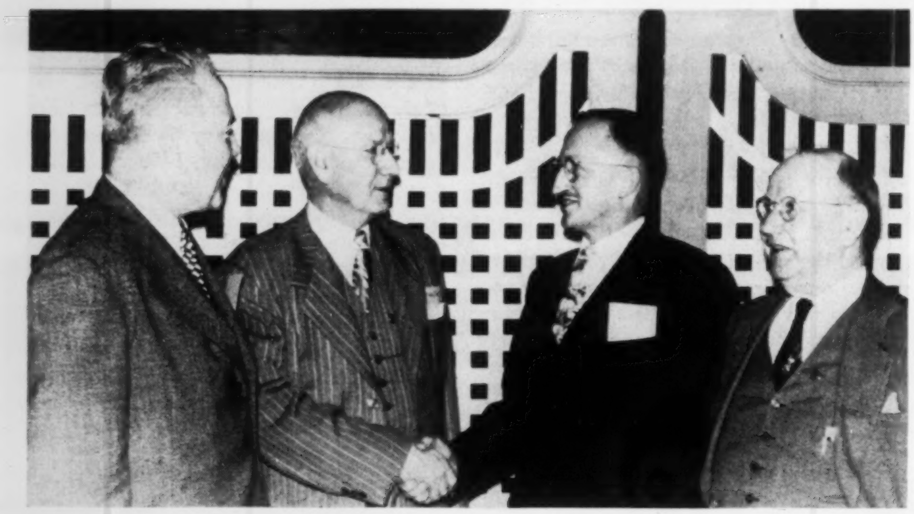
All phases of the Delaware Memorial Bridge—from legislation and financing and preliminary architectural and engineering studies through construction methods and superstructure erection features—were covered in a symposium presented at the Section's February meeting by a panel of key engineers on the project. Speakers were F. V. Dupont, chairman of the Delaware State Highway Department; H. C. Tammen, of the New York consulting firm of Howard, Needles, Tammen & Bergendoff; O. H. Ammann, New York City consultant; George L. Freeman, of Moran, Proctor, Freeman & Mueser, consultants on foundations; R. E. Desimone, vice-president of the Merritt-Chapman & Scott Corp.; and Homer R. Seely, project engineer for Howard, Needles, Tammen & Bergendoff.

SACRAMENTO

New Sacramento Section officers, unanimously elected at the recent annual meeting, are: Fred Paget, president; Edwin Sullivan, first vice-president; Arthur Showman, second vice-president; and Melvin Koontz, secretary. During the program, Walter Stoddard was honored as "the second man in the history of the Section, and probably in the history of the Society, to have attended 1,000 Section meetings." Speakers at recent luncheon meetings include Allan G. Stanford, president of the National Society of Professional Engineers, who discussed the professional status of the engineer; Lt. Col. E. I. Davis, of the Army Corps of Engineers, who described recent Isthmian Canal investigations; and retiring Section president A. G. Mott, who summarized engineering progress in 1948. At an evening meeting, held jointly with the Armed Forces Communications Association Signal Depot at Sacramento, Dr. Lewis W. Alvarez, of the University of California, spoke on "Modern Developments in Atomic Energy."

PITTSBURGH SECTION

On a recent all-day visit to the Pittsburgh Section ASCE President Franklin Thomas was given an opportunity to observe numerous local engineering projects, including the seven-mile Penn-Lincoln Parkway now under construction. Society and Section affairs were discussed at an informal luncheon with officers, directors, and committee chairman of the Section. Following dinner at the Athletic Club in the evening, at which members of the Section were guests of James P. Growdon, President Thomas spoke on the methods being adopted in engineering education to meet present-day demands that the engineer's training be founded on a broader base than is afforded by the study of technical subjects alone. Another recent dinner meeting honored the three members of the Section receiving certificates of life membership—C. Edward Long, Thomas Pealer, and Harold H. Robertson. The technical program entitled "Mapping by Aerial Photography," was conducted by Robert A. Cummings, Jr., and W. J. Dimond.



AS GUEST OF PITTSBURGH SECTION, President Thomas is greeted, in upper photo, by Section officers at dinner at Pittsburgh Athletic Association. Shown, left to right, are William A. Conwell, secretary-treasurer; President Thomas; Charles A. Keelen, Section president; and William N. Dambach, vice-president. In lower view, President Thomas visits west portal of Squirrel Hill Tunnel of Penn-Lincoln Parkway now under construction. Reading, left to right, are Section Directors John D. Dinker and James F. Baer; President Thomas; Director Wilfrid Bauknight; Ben T. Gordon, who conducted tour; Mr. Conwell; Mr. Keelen; and Irvin W. Short.

PROVIDENCE

Frank E. Fahlquist, consulting engineer geologist of Riverside, R. I., reported recent trips to Iran and South America in connection with inspection of dam sites at a dinner meeting of the Section. The program featured presentation of certificates of life membership to Sydney R. Bellows and Charles G. Richardson.

ST. LOUIS

At the first meeting of the new year, a capacity audience of 115 heard A. Carl Weber, director of research and sales engineering for the Laclede Steel Co., discuss the importance of steel in present-day life. Mr. Weber placed special emphasis on the more complete utilization of steel as a means of conservation, referring to the newly developed deformed reinforcing steel bars which permit much higher design bond stresses and adequate reinforced concrete designs with relatively less steel. Showing of a colored motion picture, entitled "Rail Steel in the World of Today," concluded the program.

SAN DIEGO

Presentation of a certificate of life membership to J. C. Wright was a highlight of the annual Ladies Night program. In his response Mr. Wright described some of his experiences during the planning and construction of the Panama Canal. The Section's annual award for high scholastic achievement was made to Fred de Aryan, who spoke briefly on the importance of the Section's student award in increasing contacts and improving relationships between the engineering student and the professional engineer. The social program concluding the evening was arranged by C. W. Capwell, who acted as master of ceremonies.

SEATTLE

Following a special committee report on salaries in the Washington State Highway Department, presented at a recent meeting by Ces Arnold, the Section passed a resolution recommending changes in the minimum salary scale to conform with recommendations of the Puget Sound Engineering Council and other ASCE Sections in the state. The technical program consisted of a talk by Dr. Charles Evans, who explained the medical profession's viewpoint of the importance of the sanitary engineer in the control of polio.

SOUTHERN IDAHO

Construction of the new Boise sewage disposal plant was described at a recent meeting by John L. Morris, city engineer of Boise. Other speakers were Charles R. Maierhofer, acting chief of the Drainage Division of the Bureau of Reclamation, who explained how drainage problems develop and what can be done to guard against them, and Allen G. Stanford, president of the National Society of Professional Engineers, who urged cooperation between the various engineering societies. The following officers were elected for 1949: J. S. Moore, president; T. R. Newell, first vice-president; R. F. Hamilton, second vice-president; Charles LeMoyne, Jr., secretary; and Wayne I. Travis, treasurer.

SPOKANE

A talk on residential construction in Spokane—by Arthur E. Victor, executive secretary of the Spokane Home Builders Association—comprised the technical program at the Section's annual meeting. The annual election of officers resulted as follows: L. V. Downs, president; Allen S. Janssen, first vice-president; W. A. Hill, second vice-president; and J. B. Barber, secretary-treasurer. At another recent meeting, the proposed constitution for the Pacific Northwest Conference of Local Sections was discussed and accepted.

TENNESSEE VALLEY

At the first meeting of the new year, members of the Chattanooga Sub-Section heard Milo Churchill, of the TVA Division of Health and Safety, speak on the effects of upstream reservoir releases, particularly in respect to cold temperatures, upon the Knoxville sewage pollution in Fort Loudoun reservoir.

A resolution affirming support of the professional employee provisions of the Taft-Hartley Law was unanimously passed at a recent dinner meeting of the Knoxville Sub-Section. The technical program consisted of an address by James B. Akers, chief engineer of the Southern Railway System, on "Railroads in the Tennessee Valley," which was published in the February issue of the *Tennessee Valley Engineer*.

Section officers were guests of the Holston Sub-Section for a recent steak dinner and discusion of Section affairs. The manufacture of twine and fishing line was described, during the technical program, by Kenneth Clark, Elizabethton manufacturer.

TOLEDO

Fabrication and uses of aluminum were covered in a symposium presented at the Section's February meeting by a panel of engineers from the Aluminum Company of America—D. Summers, B. J. Fletcher, J. Verner, and R. Moulthrop. Discussion of the Taft-Hartley Act concluded the program.

WISCONSIN

Various technical and economic aspects of pipeline construction were brought out at a recent Section meeting by W. R. Koepler, of the A. O. Smith Corp., Milwaukee, in a talk on the manufacture and field construction of transmission lines for gas. Mr. Koepler predicted that liquid petroleum products, which can be transported more cheaply by pipeline, will ultimately be manufactured by hydrogenation of coal at the mining site, and transported by pipeline to consumer markets. Sound films on the manufacture of 24-in. steel pipe and the construction of a 30-in. oil pipeline between Texas and Los Angeles concluded the program.

STUDENT CHAPTER *Notes*

CITY COLLEGE OF NEW YORK

A smoker and induction meeting, held jointly by the City College of New York Student Chapter and the Dam Club on the college campus, featured Dean John J. Theobald in the faculty section of the entertainment. Induction of 66 new members climaxed the program. Officers for the semester are: Walter Addison, president; Victor Fergelman, secretary; Leonard Oster, treasurer; and Saul Gersen, corresponding secretary.

PICTURED HERE is Dean John J. Theobald, stellar faculty performer, with accompanist, at recent CCNY smoker and induction meeting.

COLORADO A. AND M. COLLEGE

Operation of the Colorado State Highway Department was the subject discussed by Mark Watrous, state highway engineer, in an address given before a recent meeting of the Colorado A. and M. College Student Chapter at Fort Collins, Colo. Mr. Watrous explained the plans and surveys that must be prepared before a particular highway improvement can become a reality. An informal question-and-answer session followed. Preceding this part of the program, a sound movie illustrating "The Engineering Aspects of the Colorado Highway Department," was shown.

MARQUETTE UNIVERSITY

As guests of the ASME student chapter, members of the Marquette University Chapter were shown a U.S. Steel moving picture entitled, "Unfinished Business." At a recent business meeting a motion was passed to establish a committee to investigate expenses, possible sites, and dates for future inspection trips. Bernie LeVernier was appointed chairman of this committee with Bob Weber, Bob Austin, and Gene Horstketter acting as assistants. The procedure of applying for Junior membership in the ASCE and the benefits derived from such membership were reported by Jim Feeney. A gala time was enjoyed by civil engineering faculty members as well as students at a party sponsored by the Student Chapter in the White Rose Hall.

UNIVERSITY OF PITTSBURGH

Addressed on alternate weeks by prominent local civil engineers, members of the University of Pittsburgh Chapter have heard J. F. Triggs, Benjamin Aires, M. E. Frye, A. C. Ackenheil, and Michael Baker. At the close of each meeting, the speaker lunches with the officers and the Faculty Adviser, Prof. A. C. Ackenheil, Jr., as the guest of the Chapter. Strong interest by the students in the functions of the Local Section has been shown by their attendance at recent Section meetings. Other activities included a stag dinner at the Totem Pole Lodge, South Park, and active participation in sports on the campus.

MEMBERS OF LOUISIANA STATE UNIVERSITY CHAPTER (above) view large-scale model of Mississippi River Valley on recent inspection trip to U.S. Waterways Experiment Station at Vicksburg, Miss. Professors C. S. Camp and J. F. Halsey accompanied group.

PICTURED AT RECENT SMOKER MEETING of New York University Student Chapter are, left to right, above: Hugo J. Vervuort, treasurer; Eugene D. Jones, secretary; Prof. Douglas S. Trowbridge, Faculty Adviser; Dean Thorndike Saville; R. E. Dougherty, President of ASCE and speaker of evening; Arthur Hayden, senior Contact Member; Henry W. Fisher, junior Contact Member; Charles Rubin, president; and Alexander Koltowich, vice-president.

UNIVERSITY OF VIRGINIA

Railroading is a vast and fascinating field for young engineers, stated L. T. Knuckols, chief engineer, Chesapeake & Ohio Railway, in a talk presented at a recent meeting of the University of Virginia Chapter. Latest improvements and expansion projects were explained by Mr. Knuckols including the Pine Mountain and Fort Spring Tunnels, the classification yards at Russel, Ky., and Wallbridge, Ohio, and the new coal pier now under construction at Newport News, Va. C. B. Porter, assistant chief engineer, of the C. & O., accompanied Mr. Knuckols. In concluding the program, Prof. R. E. L. Gildea gave a first hand account of the aims and organization of the highway research program now being set up at the university.

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Pictorial Accounts of Student Chapter Activities Recently Received at ASCE Headquarters Are Shown Here

MEMBERSHIP OF UNIVERSITY OF PITTSBURGH STUDENT CHAPTER, pictured above, is currently 160. Recent Chapter activities are reported on page 59.

MORE THAN 350 STUDENTS COMPRISE MEMBERSHIP of University of Illinois Student Chapter (above), including students from branch organization at Navy Pier, Chicago, Ill. In front row, in usual order, are officers: Charles Lampe, secretary; Clifford Anderson, treasurer; Wendall Rowe, vice-president; and Kenneth McGann, president. Milton O. Schmidt, assistant professor of civil engineering at University, is Faculty Adviser for Chapter.

NEWS BRIEFS

Road Builders Discuss Current Highway Problems at Three-Day ARBA Meeting

EVERY COMPREHENSIVE URBAN redevelopment program should include plans for the improvement of main thoroughfares to speed up the flow of traffic on city streets, Maj. Gen. Philip B. Fleming, M. ASCE, Federal Works Administrator, told members of the American Road Builders' Association in a key address given at the organization's three-day annual meeting, held in Washington, D.C., February 7–9. Discussing "The Road Builders' Place in Urban Redevelopment," General Fleming declared that slum clearance and other civic improvements should be integrated with highway construction to prevent "waste, inefficiency, and duplication of effort."

Noting that there has been an increase of more than 10,000,000 in private and commercial motor vehicle registration in the past three years, he predicted that the demand for highway service during the next ten years will exceed anything experienced in the past, and warned that "our highway transportation system in congested urban areas will break down completely if we do not act soon to provide the facilities required for the fast and safe movement of large volumes of traffic. We are rapidly approaching the saturation point in the amount of traffic on main routes in metropolitan areas. Despite the millions of dollars that are being poured into highway improvements, highways approaching large cities and arterial streets within the city are daily becoming more clogged with traffic.

"Although expressways are under construction in a number of large cities, the improvement of urban highways in general has been retarded by difficulties in acquiring title to land required for rights-of-way and in finding new homes for tenants of buildings that must be demolished to make way for express routes. Since express routes must be directed toward the downtown section of cities and generally pass through slum areas, some of the difficulties in acquiring rights-of-way could be avoided if plans for slum clearance were tied in closely with plans for the development of express routes."

In conclusion, General Fleming advocated a far-reaching plan comprising all phases of urban redevelopment, including highways, that would make it possible to spread the heavy cost of improvements over a period of years through stage construction.

Other ASCE speakers addressing the technical sessions on a wide variety of highway and airport problems included Honorary Member Thomas H. MacDonald, Joseph Barnett, Ben H. Petty, J. S. Bright, William W. Michael, Carl H. Walther, A. T. Goldbeck, O. J. Porter, I. B. Rutledge, Walter G. Johnson, and George B. Schoolcraft.

Among the presiding officials were Society members Charles M. Upham, engineer-director of the ARBA, Leslie Williams, Miles D. Catton, Harold F. Clemmer, Charles M. Noble, W. K. Myers, Bruce D. Greenshields, James A. Anderson, and Wesley W. Polk.

Following his induction into office as president of the ARBA at the concluding session, E. R. Needles, M. ASCE, member of the New York firm of Howard, Needles, Tammen & Bergendoff, addressed the meeting on the subject, "Thoughts About the Future for ARBA."

◆

Members Take Part in Atomic Energy Seminar

SANITARY ENGINEERS MUST take an active interest in nuclear fission and the problems it entails, especially in the field of waste disposal, Abel Wolman, M. ASCE, professor of sanitary engineering at Johns Hopkins University, told engineers and scientists attending a recent two-day seminar on the disposal of radioactive wastes, conducted by the U.S. Atomic Energy Commission in Washington, D.C.

In an appraisal of the sanitary engineering problems involved in the atomic energy program, Dr. Wolman stated that engineers need not be converted into nuclear fission experts. "There should be a sharp distinction made between the use of these materials on a highly expert basis and the control of the use of these materials on a highly expert basis," he declared. "On the control function as a general thing, the sanitary engineer and the water sewage plant operator have had long experience. There was a time in their experience when the evaluation, the diagnostic determination, and the relating of the significance of bacterium coli was a mysterious process even to people here today. But it became a tool of their trade. I predict that the same thing will and should happen in respect to the products of nuclear fission industry and research.

"In this field, the normal environmental problems with which sanitary engineers must deal are functions of measurement." Later, he pointed out, the group will be concerned with "the epidemiology of nuclear fission operations and its by-products."

The disposal of gaseous and solid wastes in the atomic energy industry was the subject of another talk, presented at the seminar, by Arthur E. Gorman, M. ASCE, of the Engineering Division of the Atomic Energy Commission. Mr. Gorman is represented in the current issue (page 29) with a paper on the sanitary engineer's role in handling problems of nuclear fission operation, which was delivered before the ASCE Sanitary Division during the recent Annual Meeting.

Other Society members taking part in open forums and discussions during the seminar include Willem Rudolfs, of the New Jersey Agricultural Experiment Station; George J. Schroepfer, professor of sanitary engineering at the University of Minnesota; Ray L. Derby, principal sanitary engineer for the Los Angeles Department of Water and Power; Stanley T. Barker, of the New York State Department of Health; Rolf Eliassen, professor of sanitary engineering at New York University; C. J. Velz, professor of sanitary engineering at Manhattan College; Harry Jordan, secretary of the American Water Works Association; and W. H. Wisely, executive secretary of the Federation of Sewage Works Associations.

In attendance at the conference were key representatives of the American Water Works Association, the Federation of Sewage Works Associations, the Conference of State Sanitary Engineers, the Conference of Municipal Sanitary Engineers, and various federal agencies.

◆

President Urges Vast Columbia River Authority

AT THE REQUEST of President Truman, Cabinet members are drafting a bill for creation of a huge Columbia Valley Authority, which will soon be ready for Congressional action. The bill advocates construction of a series of projects, similar to those in the TVA development, on all the major streams of the vast Columbia River system. These projects would be interrelated and multiple purpose, serving for flood control, reclamation, and power.

The Columbia Basin, according to government definition, includes Washington and part of Oregon, Montana, Idaho, the Arrow Lakes in British Columbia, and (through the tributary Snake River) northern Nevada, northwestern Utah, and western Wyoming. The Grand Coulee and Bonneville projects would comprise about two-thirds of the proposed CVA. Coordination of previous Columbia Basin studies and the draft of the pending CVA bill is under way.

To alleviate the present acute power shortage in the state of Washington, engineers and legislators are seeking support for construction of a rock-and-earth storage dam, 50 ft high, on the Arrow Lakes at Castlegar, British Columbia, to supplement waters now utilized by the Grand Coulee system.

Philadelphia Proceeds with Public Works Program

A broad program of public improvements, totaling $257,305,800 for the six-year period, 1949–1954, is recommended by the Philadelphia City Planning Commission in its annual report to the mayor and the city council. The program includes the construction required to complete numerous projects now under way and to undertake additional improvements as soon as funds are available.

To finance the program, the report states that the city will provide $145,000,000 in new loans, of which $75,000,000 will go for the water-works and sewerage systems. It is expected that the state will spend $47,440,000 for highway construction and rehabilitation, and that $1,770,000 will come from the federal and state governments for airport construction. Assessments against property owners for water mains and meters and sewers will provide $11,800,000. In addition, the railroads are expected to spend approximately $20,000,000 on joint city-railroad projects, and the city has on hand about $50,000,000 from unexpended balances of authorized municipal loans.

Outstanding among numerous projects for the construction of bridges and highways is the proposed Schuylkill Expressway, to be built along the west bank of the Schuylkill River from University Avenue to City Avenue, where it will connect with a link to the terminus of the Pennsylvania Turnpike at King of Prussia, Pa. Other important projects include water-works and sewerage additions and improvements, airport construction, flood control work, subway extension, recreational facilities, and public housing and redevelopment.

Established in 1942, the Philadelphia City Planning Commission is headed by Edward Hopkinson, Jr. ASCE members on the Commission include Thomas Buckley, director of public works; Lawrence Costello, chief engineer of the Philadelphia Department of City Transit; and Charles A. Howland, chief of the Division of Projects.

◆

Engineers Reserve Unit to Affiliate with U.S.B.R.

Affiliation of an Engineer Brigade, the largest unit activated to date under the Army Organized Reserve Corps' Affiliation program, with the Denver office of the Bureau of Reclamation has been announced by Col. Frederick S. Lee, Colorado Senior Army Instructor. The first of its type, the new unit will be under the command of Col. Grant Bloodgood. Other senior officers include Col. Donald P. Barnes, M. ASCE, as chief of staff, and Lt. Col. Harold E. Miller, chief of operations.

University of Washington Is Host to Highway Engineers

To acquaint local highway engineers with recent advances in highway construction the University of Washington sponsored the Second Northwest Conference on Road Building, February 7–9. Robert G. Hennes, M. ASCE, professor of civil engineering at the university, was in charge of the program, which included talks by experts in the field, open forum discussions, and laboratory demonstrations.

A highlight of the three-day conference was a report on the proposed highway programs for Oregon and Washington, recommended as the result of a fact-finding survey recently completed by the Automotive Safety Foundation. The report was presented by G. Donald Kennedy, M. ASCE, vice-president of the ASF, Washington, D.C., who was in charge of the survey.

Other ASCE members represented on the program included H. F. Gonnerman, assistant to the vice-president for research and development of the Portland Cement Assn., who described researches in Portland cement and W. L. Shannon, who discussed underdrainage, frost action, and stability tests of soil made during his connection with the Army Corps of Engineers.

The attendance of more than 250 included engineers from all over the Pacific Northwest.

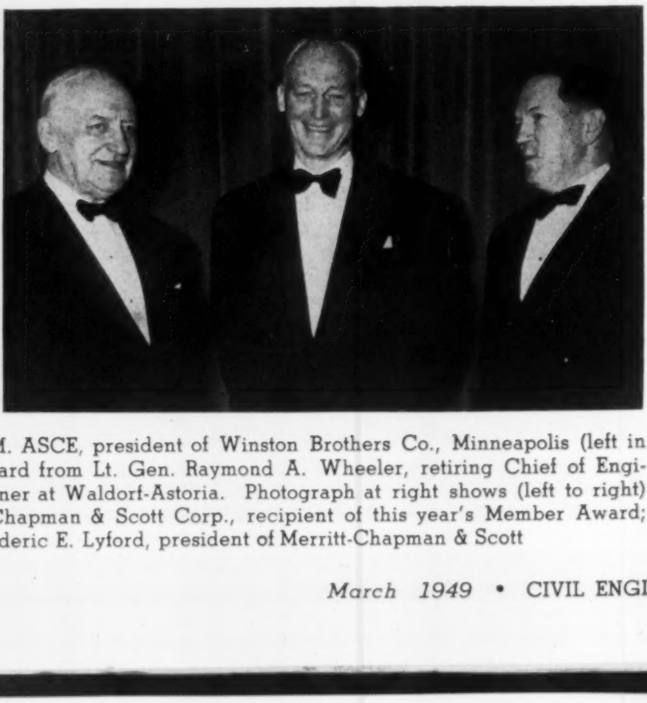
ASCE Member Receives 1949 Moles Construction Award

Two nationally known contractors—Luther S. Oakes, Assoc. M. ASCE, president since 1921 of the Winston Brothers Co., of Minneapolis, and Capt. Thomas A. Scott, chairman of the board of the New York construction and salvage firm of Merritt-Chapman & Scott—were honored for "outstanding contributions to construction progress" at the annual dinner of The Moles, held at the Waldorf-Astoria in New York on February 9. The Moles, New York society of tunnel and heavy construction men, annually award a bronze plaque to one member of their group and one non-member who are outstanding in the industry. Richard V. Hyland, M. ASCE, was chairman of The Moles Award Committee.

The member award to Captain Scott was made by Frederic E. Lyford, president of Merritt-Chapman & Scott, who told more than 1,000 leading construction men attending the dinner, that Captain Scott "is a great construction man because he believes in construction, because he has the vision and courage to expand both scope and size of operations." Captain Scott's achievements include raising the *Normandie* after it burned and sank at its pier in the Hudson River.

In presenting the non-member award to Mr. Oakes, Lt. Gen. Raymond Wheeler, retiring Army Chief of Engineers and last year's winner of the Moles' non-member award, paid tribute to him as follows: "Today useful structures, highways, railroads, locks and dams, tunnels and bridges, span the Western Hemisphere as enduring monuments to his technical proficiency. Improvements in construction methods bespeak his business acumen." Major construction projects with which Mr. Oakes has been identified during his 48 years in the industry, include construction of three transcontinental railroads.

Established in 1941, the Moles awards have been won by a distinguished list of engineers, including Lt. Gen. Brehon Somervell, Rear Admiral Ben Moreell, and the late Frank Crowe, Honorary Members ASCE, and Miles I. Killmer, M. ASCE.



IN VIEW AT LEFT, Luther S. Oakes, Assoc. M. ASCE, president of Winston Brothers Co., Minneapolis (left in photo), receives 1949 Moles Non-Member Award from Lt. Gen. Raymond A. Wheeler, retiring Chief of Engineers, U.S. Army, at Moles recent annual dinner at Waldorf-Astoria. Photograph at right shows (left to right) Capt. Thomas A. Scott chairman of Merritt-Chapman & Scott Corp., recipient of this year's Member Award; J. Richard Steers, president of Moles; and Frederic E. Lyford, president of Merritt-Chapman & Scott

New Metropolitan Traffic Board Headed by Members

Appointment of two ASCE members and traffic experts to head New York City's newly established Traffic Commission has been announced by the mayor's office. John C. Riedel, chief engineer of the Board of Estimate, has been named chairman of the new group, and T. T. Wiley, for the past ten years assistant city traffic engineer of Detroit, will fill the post of executive director. Frederick H. Zurmuhlen, M. ASCE, commissioner of public works, will also be a member of the seven-man board, and Lloyd Reid, M. ASCE, former Detroit traffic director, will serve as a technical adviser to the commission.

John C. Riedel

T. T. Wiley

Creation of the new department, which consolidates the scattered functions of many official agencies, marks the end of a long struggle on the part of civic groups to set up a separate organization to cope with the complex metropolitan traffic situation. The local law establishing the commission strips the police of all power over traffic rules and regulations and relegates them to an enforcement body, with direct responsibility for traffic control vested in the new group.

Early action taken by the commission will include a request for legislation to provide for off-the-street parking facilities; zoning; determining whether parking meters should be used; and consideration of the feasibility of establishing a Parking Authority.

◆

Industry Asked to Save Iron and Steel Scrap

Industrial cooperation in the nation-wide drive now under way for heavy iron and steel scrap is being asked by Secretary of Commerce Charles Sawyer in letters circularizing business paper editors and officials of trade associations and chambers of commerce.

In describing the drive, Secretary Sawyer writes: "Providing sufficient quantities of iron and steel heavy scrap to assure maximum steel production is a job that needs to be done. Every pound of steel produced can be put to valuable use in our economy. Moreover, we must build up scrap reserves to be able to meet any emergency demands. We are not planning an all-out wartime type of scrap campaign. We are seeking to stimulate operating executives to canvass their plants so that obsolete machinery, tools, and fixtures will be collected for use as scrap."

To ensure the success of the drive, the Department of Commerce suggests that each plant should appoint one top official as salvage director with full responsibility to investigate heavy scrap possibilities and authority to sell any unneeded iron and steel equipment. It states that "scrap so collected can best be supplied to steel and mill foundries through normal channels of trade—the local scrap dealers who are equipped to prepare and ship it promptly."

University of Iowa to Be Host to Hydraulics Group

Plans for the Fourth Hydraulics Conference, to be held at Iowa City, June 12–15, have been announced by the Iowa Institute of Hydraulic Research, sponsoring organization. The program will include five technical sessions, a guided tour of the new Institute facilities, and numerous informal gatherings. Thirteen correlated papers will comprise a symposium on present-day principles and methods of analysis.

◆

PRA Reports Decline in Highway Improvement in 1948

Despite the fact that substantial progress was made in the improvement of primary and secondary roads in all sections of the country in 1948, there was an actual decline in the mileage of improvements over 1947, according to the Public Roads Administration. Reviewing the progress of the highway improvement program, PRA Commissioner Thomas H. MacDonald, Hon. M. ASCE, said contracts awarded by state agencies for all classes of road work during the first eleven months of 1948 totaled $1,056,442,000 for 37,422 miles of road, exclusive of the cost of right-of-way, engineering services and contingencies. In the same period of 1947, expenditure of $832,033,000 accomplished improvement of 42,422 miles of road.

This increase in total construction cost, with a reduction in mileage improvement during the past year, Commissioner MacDonald explained, reflects two important factors in highway development—steadily increasing construction costs for all types of road work and a greatly accelerated program of urban improvements involving more expensive projects.

Practically all of the big jobs placed under contract in 1948 were on sections of the new 40,000-mile interstate highway system, comprising the most heavily traveled routes on the federal-aid primary system and including urban extensions. In nearly every large city action was taken during the year to promote the development of expressways that will speed up the movement of traffic and relieve congestion on downtown streets. In a number of cities, expressways designed to carry large volumes of traffic safely at speeds of 40 to 50 mph through crowded districts were under construction at the end of the year.

In the past three years, Mr. MacDonald reported, 1,490 miles of highways on the interstate system have been improved to modern standards at a cost of $161,166,000, of which the federal contribution was $85,357,000. On December 1, improvements on an additional 655 miles were under construction, at a cost of about $207,000,000.

In conclusion, he emphasized, "the need for highway improvements is accentuated by the fact that highway usage has increased steadily since the war. The estimated total of motor-vehicle registrations during the past year exceeds 41,000,000, topping all previous records. The total volume of travel during the year is put at 395,000,000,000, as compared with a total of 370,000,000,000 miles in 1947."

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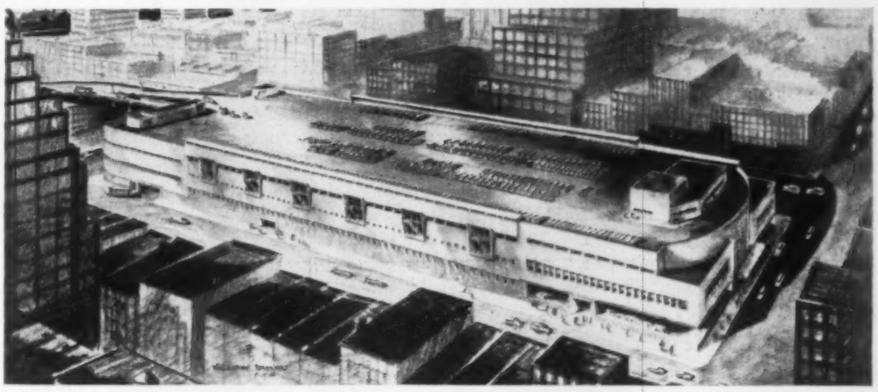
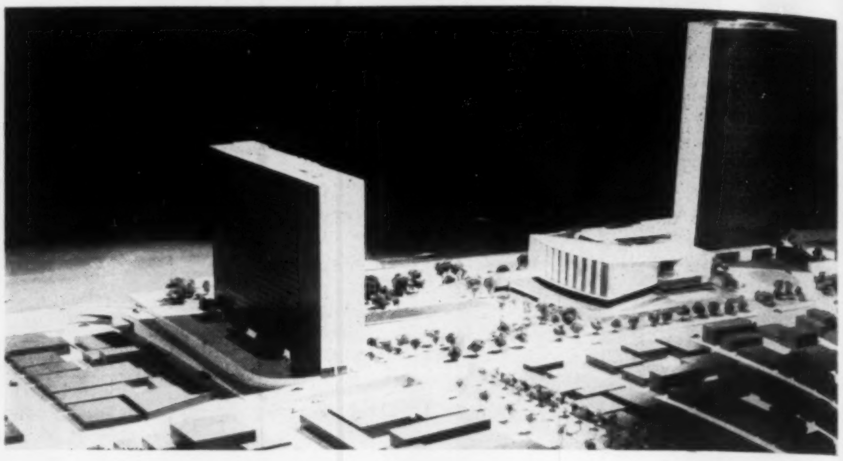
Huge Bus Terminal Will Ease Metropolitan Traffic



ARTIST'S CONCEPTION OF $20,000,000 UNION BUS TERMINAL, for which Port of New York Authority recently broke ground in mid-town Manhattan, shows overhead ramp connection (left) between Ninth Avenue end of terminal and Lincoln Tunnel. Provision of radiant heating for 1,500-ft network of overhead ramps will keep concrete runways free of snow and ice. Four stories high, project will have peak capacity of 1,500 bus arrivals and departures each hour, and provide parking space on roof for 450 automobiles.

Contract Awarded for Construction of UN Headquarters

CONSTRUCTION OF UNITED NATIONS permanent headquarters, on East River in mid-town Manhattan, is about to begin, with award of $23,809,573 contract to Fuller-Turner-Walsh-Slattery, corporation consisting of four leading contracting companies, for construction of Secretariat Building (far right in model of photo). First unit in projected UN headquarters, 23-story Secretariat Building will have exterior facing of aluminum, glass, and marble. With delivery of 13,000 tons of steel for building already under way, it is estimated that steel erection will be completed by October 1, and occupancy is scheduled for fall of 1950. Secretariat Building, which will have capacity of 3,200 persons, will service Councils and Assembly Buildings (left and center in photo), next to be constructed. Photo from UN Department of Public Information.



European Structural Practice Reported at Engineering Congress

EUROPEAN PRACTICE IN the field of reinforced concrete employs several methods generally foreign to American engineering practice, Ernest E. Howard, former ASCE Vice-President, told engineers attending the Cooperative Session of the United States Council of the International Association for Bridge and Structural Engineering, held during the recent Annual Meeting of the Society. Reporting the Third Congress of the Association, which met in Liege, Belgium, in September 1948, Mr. Howard stated that the most novel developments in foreign practice seem to be in prestressing.

Among outstanding structures described during the two sessions on reinforced concrete, he said, was a 350,000-sq ft, prefabricated, prestressed concrete factory building under construction in Ghent. "This building has spans of 70 ft, erected with prefabricated units. Except for the roof slabs, the structure was prefabricated on the job with the use of a limited number of steel forms, which were made on the ground and then raised to position. Somewhat similar construction was employed on the hangars for the new airport in Brussels, which have spans of 170 ft. Hollow girders 10 ft deep, 170 ft long, weighing 300 tons, were fabricated on the ground, prestressed, and then jacked up 33 ft to position on the wall supports. The arrangements for prestressing rather than the erection of prefabricated units were most novel."

Other sessions, Mr. Howard stated, dealt with steel structures, including long-span bridges. At the latter session, Mr. Howard substituted for O. H. Ammann, M. ASCE, who had been named General Reporting Member, and read Mr. Ammann's introductory paper on the theme. The final session was devoted to discussion of impacts and dynamics in their effect on the safety and service of structures, with special attention to aerodynamic effects. Foreign interest in aerodynamic stresses has been widespread since the failure of the Tacoma Narrows Bridge, the speaker declared.

At the conclusion of the congress, inspection trips were made to Eupen Dam now nearing completion; to observe the ingenious method being used to reconstruct the De Moresnet railroad viaduct, where 11 of 22 truss spans and some of the supporting piers had been destroyed by the Germans in their final retreat; and to view extensive terminal developments in Brussels, which include reconstruction of railroad stations and other projects.

The attendance of more than 500 engineers represented 28 countries. American engineers present, in addition to Mr. Howard, included L. Coff, New York City consultant, and Eric L. Erickson and George S. Vincent, M. ASCE, of the Public Roads Administration. Plans are being made to hold the next congress in England in the late summer or early autumn of 1952.

Proceedings of the Third Congress, recently made available in book form, are reviewed briefly on page 84 of this issue.

◆

1948 Materials Production Exceeds All-Time Peak

PRODUCTION OF CONSTRUCTION materials broke all records in 1948, and still further increases are expected in 1949, according to the Producers' Council. "Dealers' inventories of most products have improved substantially, and production of some building materials and equipment items has increased to the point where output has been cut back," a recent report of the organization states.

Pointing out that materials requirements in 1949 will probably be somewhat smaller on the whole than in 1948, because only a slight increase in the volume of new construction is expected and decreases in the amount of repair and maintenance work are anticipated, the Council predicts that a materials supply equal to or somewhat larger than the supply available in 1948 should be adequate for all needs.

"The supply of steel will probably be tight in 1949, but should be as large as in 1948 and may be a little greater. Cement supplies should be sufficient, but there will be no surplus, and there may be local shortages, owing to the geographical location of cement plants. Cement production reached an all-time high in October 1948.

"Construction lumber no longer is a problem, so far as supply is concerned. There is still no surplus of millwork, but the backlog of orders on hand has been decreasing in recent months.

"Steel pipe is probably the most difficult construction material to obtain at the present time. Nail production has improved greatly, with the result that local shortages are less common and severe than a year ago. Fabricated structural steel has been available in needed quantities, but often with a waiting period of several months.

"Gypsum board and lath, roofing materials, building board, insulation board and materials, plumbing fixtures, and brick and tile should be available as needed in the new year."

The Council bases its predictions on the assumption that there will be no prolonged strikes in steel, coal, or transportation, and that military preparations will not require more basic materials than is currently expected.

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Large UNESCO Conference Scheduled for Cleveland

EDUCATIONAL RECONSTRUCTION IN war-devasted countries and UNESCO as the educational arm of the United States will constitute principal topics of discussion at the Second National Conference on UNESCO, which is being called by the U.S. National Commission on UNESCO as part of a program "to promote peace and security through international understanding." An attendance of over 3,000 delegates representing 800 educational, cultural, scientific, business and professional organizations on a national scale is expected.

Western Construction Projects Listed by U.S.B.R.

BID CALLS CURRENTLY expected on a number of Western construction projects are announced by the Bureau of Reclamation in its *Advance Construction Bulletin* issued on February 1. Projects, on which preliminary information only is given, include the following:

PLATORO DAM
San Luis Valley Project, Colorado

Location: On the Conejos River about 40 miles west of Alamosa, Colo.

Work: Construction of Platoro Dam, an earthfill structure 180 ft in height above river bed and 1,500 ft long; a dike 90 ft long and 20 ft in height; and a 1,000-ft long, concrete-lined, outlet tunnel.

Open excavation	1,150,000 lb
Tunnel excavation	3,400 cu yd
Earthfill	975,500 cu yd
Furnishing and placing reinforcing steel	150,000 lb
Furnishing and installing steel liner plates and supports	250,000 lb
Furnishing and handling cement	8,500 bbl
Concrete	3,150 cu yd
Time Allowed for Completion:	1,300 days

SUPERIOR CANAL
Missouri River Basin Project, Nebraska

Location: Near Superior, Nebr.

Work: Construction of earthwork and structures for about 12.5 miles of Superior Canal, 139 to 122 cfs capacity.

Excavation for canal and wasteways	533,000 cu yd
Excavation for drainage, channel improvement, core banks, and structures	103,000 cu yd
Furnishing and placing reinforcing steel	206,000 lb
Furnishing and laying 66-in.-dia precast concrete pipe	3,000 ft
Concrete in structures and lining	2,500 cu yd
Furnishing and handling cement	3,440 bbl
Time Allowed for Completion:	600 days

CHANNEL ENLARGEMENT
Klamath Project, Oregon-California

Location: 6 miles south of Klamath Falls, Ore.

Work: Enlargement of Lost River diversion channel from Lost River to Klamath River.

Excavation	1,050,000 cu yd
Removing concrete	740 cu yd
Removing gates and hoists	15,750 lb
Concrete	2,083 cu yd
Furnishing and handling cement	3,100 bbl
Furnishing and placing reinforcing steel	225,000 lb
Furnishing and erecting timber	340 Mfbm
Furnishing and erecting structural steel	17,420 lb
Furnishing and installing gates and miscellaneous metalwork	63,000 lb
Time Allowed for Completion:	530 days

HORSETOOTH FEEDER CANAL AND SIPHONS
Colorado-Big Thompson Project, Colorado

Location: Near Loveland, Colo.

Work: Construction of earthwork, concrete lining, and structures for the 10-mile long, 550 cfs capacity, Horsetooth Feeder Canal, including 12 concrete siphons and placing one steel siphon. The government is to furnish steel for the siphon.

Excavation for canal	250,000 cu yd
Excavation for structures	131,000 cu yd
Concrete	22,000 cu yd
Furnishing and placing reinforcing steel	2,290,000 lb
Furnishing and handling cement	33,300 bbl
Time Allowed for Completion:	480 days

WILLWOOD CANAL RELOCATION
Shoshone Project, Wyoming

Location: Near Ralston, Wyo.

Work: Construction of earthwork, concrete canal lining, and concrete siphon for relocation of about 1,000 ft of the Willwood Canal.

Excavation	52,500 cu yd
Earthfill	1,700 cu yd
Concrete	540 cu yd
Furnishing and handling cement	815 bbl
Furnishing and placing reinforcing steel	78,200 lb
Furnishing and laying 6-in.-dia sewer pipe	850 ft
Time Allowed for Completion:	240 days

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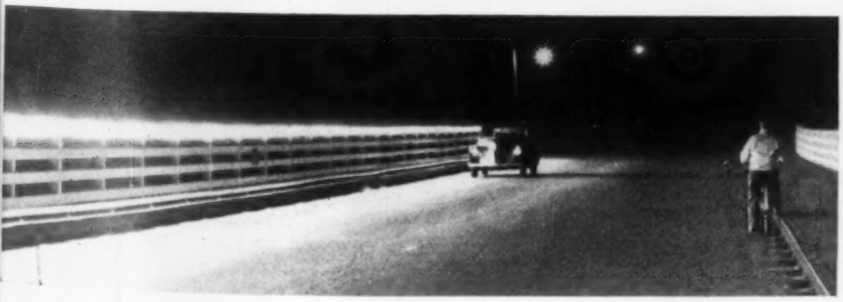
New Type of Highway Lighting Is Tested



ROW OF 8-FT SLIMLINE FLUORESCENT LAMPS, mounted 5 ft above roadway on fence rail along one side of bridge, comprises new method of highway lighting being tested by Sylvania Electric Products, Inc., on Kernwood Bridge between Salem and Beverly, Mass. Light, thrown across 32-ft roadway, illuminates sidewalk and curbing sufficiently to permit motorists to drive through area without use of headlights, eliminating dangerous glare and increasing safety. Louver provided on fixture shields lamp from motorist's eyes.

UNESCO Compiles List of International Fellowships

MORE THAN 10,500 opportunities for international study in 166 subject fields in 27 countries, including the United States, are listed by UNESCO in a recent handbook entitled *Study Abroad*. Many awards in science, engineering, and public health are included in this comprehensive compilation of fellowships, scholarships, and educational exchange opportunities. Information on educational programs has been contributed to the publication by Australia, Belgium, Burma, Canada, China, Colombia, Czechoslovakia, Ecuador, Eire, Finland, France, India, Italy, New Zealand, Norway, the Philippines, Portugal, South Africa, and the United States.

The handbook, which was prepared by William D. Carter, is published in English and French. Copies are being distributed to educational organizations and libraries all over the world, and they may be purchased from the Columbia University Press, New York 27, N.Y., at $1 each.

◆

City of Los Angeles Acts to Unify Its Traffic Control

RECOMMENDATIONS FOR THE solution of Los Angeles' serious traffic problems—made by the Los Angeles Traffic Survey Committee after a nine-month study of the situation—are being adopted by the city council. These recommendations include establishment of a city Department of Traffic Engineering, headed by a director, and creation of a five-member Traffic Commission and a Technical Coordinating Committee of city department heads to act in an advisory capacity.

The new plan is designed to effect centralization of authority and eliminate confusion resulting from the present system, which scatters traffic jurisdiction through nine city departments and agencies.

D. Grant Mickle, M. ASCE, traffic engineer for the Automotive Safety Foundation, headed the Traffic Survey Committee. Serving with him were Joseph E. Havenner, Jun. ASCE, manager of the Public Safety Department of the Automobile Club of Southern California, and Stuart M. Bate, chief engineer of the Los Angeles Traffic Association.

General Pick Nominated New Chief of Engineers

Maj. Gen. Lewis A. Pick, for the past three years Missouri River Valley division engineer and co-author, with W. G. Sloan, M. ASCE, of the Pick-Sloan Plan for the development of the Missouri Valley, has been nominated by President Truman to succeed Lt. Gen. Raymond A. Wheeler as Chief of Engineers, U.S. Army. General Pick's war service in the China-Burma-India Theater included construction, operation, and maintenance of the Ledo Road.

Lewis A. Pick

R. A. Wheeler

General Wheeler is closing a 40-year Army career to become chief engineer of the International Bank for Reconstruction and Development. His new position is connected with the government's program to develop backward regions of the world.

◆

Refresher Courses Will Be Given for Young Engineers

For engineers desiring review of supplemental training or to prepare for professional engineer license tests in New York or New Jersey, the metropolitan sections of the ASME and AIEE are sponsoring their annual spring brush-up courses. Ten evening courses will be offered in from 10 to 20 weekly sessions. Civil engineering subjects being taught include engineering economics and practice and structural planning and design. Of general interest will be the courses in effective speaking and basic engineering sciences.

Further information may be obtained from the headquarters of the ASME and AIEE, 29 West 39th Street, New York 18.

◆

Increase in Engineers Starting Salaries Shown

Average starting salaries for June 1948 graduates of the New York University College of Engineering were $252 a month, an increase of $25, or 11 percent, over the 1947 average, according to the university's placement service. The largest starting salary increase—16 percent—appeared to be in the aeronautical and administrative engineering fields.

Civil engineers are fourth on the list, their average starting salary of $255 representing an 8.5 percent increase over the 1947 starting salary of $235. The ASCE salary schedule, established in October 1946, calls for a minimum starting salary of $225.

Construction Roundup

From the Construction Industry Information Committee—Washington, D.C.

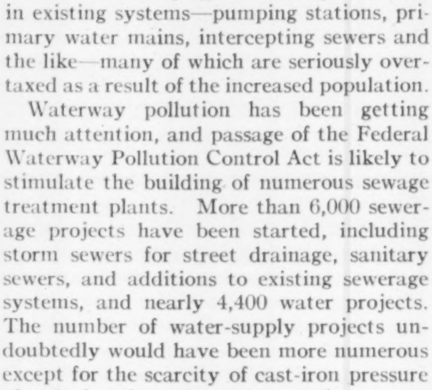
Nearly a billion dollars has been spent since the war for construction of sewer and water installations to keep pace with the rapid spread of new homes and other buildings throughout the country. Expenditures for sewer and water construction doubled from 1945 to 1946 and then almost tripled from 1946 to 1948, totaling an estimated $458 million in 1948.

If the past pattern repeats itself, the full expansion in this field is yet to come. Usually the greatest activity in sewer and water construction comes several years after the peak in residential construction. The emphasis so far has been on facilities to provide service to new buildings and new neighborhoods. It is likely to shift to improvements in existing systems—pumping stations, primary water mains, intercepting sewers and the like—many of which are seriously overtaxed as a result of the increased population.

Waterway pollution has been getting much attention, and passage of the Federal Waterway Pollution Control Act is likely to stimulate the building of numerous sewage treatment plants. More than 6,000 sewerage projects have been started, including storm sewers for street drainage, sanitary sewers, and additions to existing sewerage systems, and nearly 4,400 water projects. The number of water-supply projects undoubtedly would have been more numerous except for the scarcity of cast-iron pressure pipe during the early postwar period.

The value of sewerage and water construction carried out in 1948 was 38 percent greater than in 1947.

Giant Straddle Truck Speeds Pipe Laying



MAMMOTH MACHINE, designed for pipe laying by Hyster Co., of Portland, Ore., will permit handling of 40-ft sections of steel pipe, 56 in. in diameter, weighing 11 tons each. Giant size of truck, which is $11^1/_2$ ft wide, 13 ft high, and $16^1/_4$ ft long, with capacity of 30,000 lb, is illustrated by fact that car can easily pass under it.

Plans for Western Metal Congress Are Announced

Local groups of the Founder Societies, the Society of Automotive Engineers, and nearly 20 other technical groups are cooperating in plans for the Western Metal Congress and Exposition, to be held in Shrine Convention Hall, Los Angeles, April 11–15. Technical programs will be presented by the Metals Division of the AIME, the American Society for Metals, the American Welding Society, and the American Foundrymen's Society.

With more than 200 firms represented, the exposition will particularly demonstrate what is new or improved in ferrous and non-ferrous metals, welding supplies and equipment, heat-treating equipment and service, foundry supplies, inspection and testing aids, materials handling, metal cutting, machining equipment, and tools.

Positions Announced

Detroit's Civil Service Commission. Competitive examinations for the following classes of positions are announced for March 25: Junior City Planner, $3,139 to $3,590, and Intermediate City Planner, $3,908 to $4,385. Applications should be filed with the City of Detroit, Office of the Civil Service Commission, 735 Randolph Street, Detroit 26, Mich., before March 19.

New Jersey Department of Civil Service. The new position of Director of Environmental Sanitation, with a salary range of $9,000–$12,000, is announced by the State of New Jersey Department of Civil Service. The position will be open to both men and women, with preference given to eligibles passing the examination who have resided in New Jersey for at least a year. Requirements include the educational equivalent of graduation from college with the degree of bachelor of science in sanitary engineering or civil engineering and possession of a degree of master of public health or master of science and 10 years of experience in public health engineering. A bibliography of published writings should accompany applications, which must be filed by April 1.

U. S. Civil Service Commission. Examinations for Highway Engineers and Highway Bridge Engineers for positions in the Public Roads Administration and other federal agencies in Washington, D.C., and other parts of the country, have been announced by the U.S. Civil Service Commission. A few positions outside the United States are also available. Salaries range from $3,727 to $5,232 a year. Further information and application forms may be obtained from most post offices, civil service regional offices, or the U.S. Civil Service Commission, Washington 25, D.C.

U.S. Public Health Service. Competitive examinations for appointment of Engineer Officers in the Regular Corps of the Public

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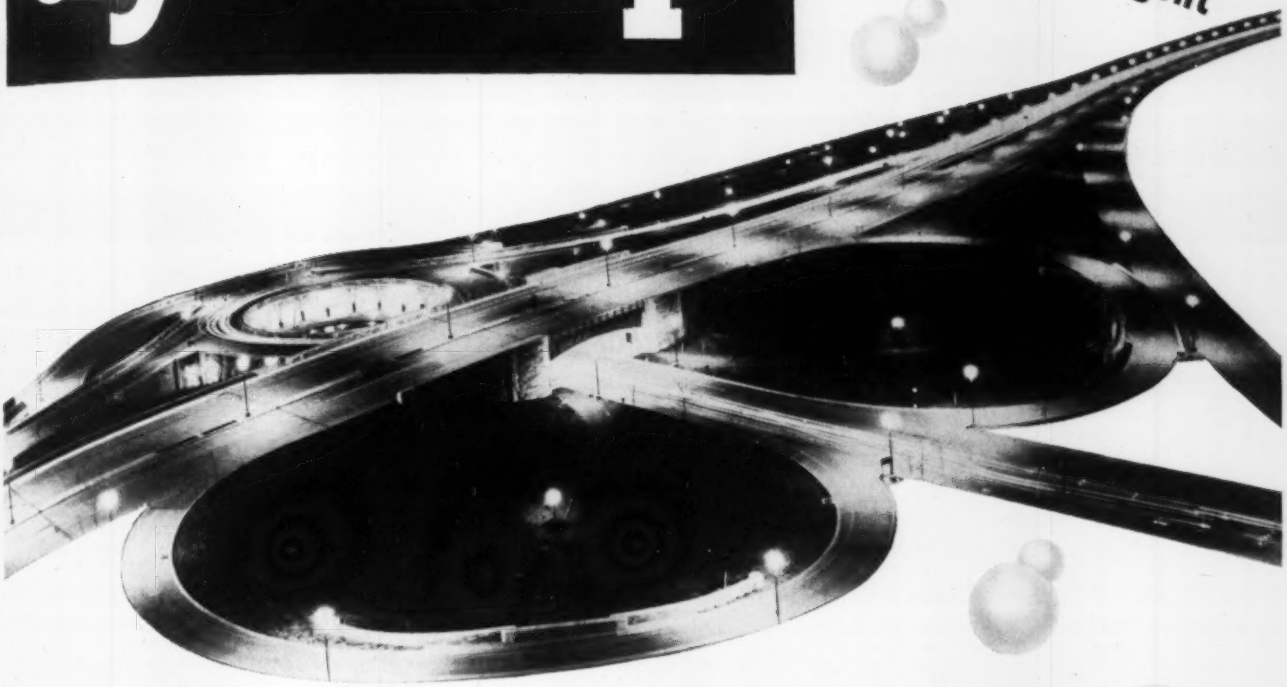

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AYR-TRAP in concrete makes it more durable, increases its plasticity and minimizes segregation and bleeding. Ayr-Trap can be added at batching plants or on the job and is used in concrete for roads, exposed structures, dams, bridges and in cement mortars.

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CHEMICAL CORPORATION

Health Service will be held April 11, 12, and 13 in various cities throughout the country. Appointments will be made in the grades of Junior Assistant Sanitary Engineer (2d lieutenant), Assistant Sanitary Engineer (1st lieutenant), and Senior Assistant Sanitary Engineer (captain). Entrance pay ranges from $3,391 for the grade of Junior Assistant, with dependents, to $4,489 for the grade of Senior Assistant. Promotions are at regular intervals up to and including the grade of Senior Sanitary Engineer, which corresponds to the rank of lieutenant colonel, at $7,019. Applications must be received prior to March 18. Forms and additional information may be obtained from the Surgeon General, Public Health Service, Washington 25, D.C.

N. G. NEARE'S Column

R. Robinson Rowe, M. ASCE

"I HOPE," SAID the Professor, "that our worm race has encouraged some outside reading. I doubt that less is known generally about so common a subject, even by the experts. Volumes have been written about the diet of worms without stating definitely what the worm eats or why. All races entered by Poe's conquering worm were the same to the worm but he never ran in one. In our race, at least, we'll find out how long a worm is, won't we Joe?"

"Maybe," said Joe Kerr. "Slippy ran the first half at 3.6 ipm, and 14.4 in. more before he finished two lengths behind, so a length is 1.8 in. But Sluppy ran the last 20 in. at 5 ipm and therefore 45 in. in 9 min., so his handicap of 2 lengths was 9 in. or 4.5 in. per length. I guess it's a matter of posture: the worms were stretched out at the post and looped up like inchworms at the tape. So I say a worm is 4.5 in. long."

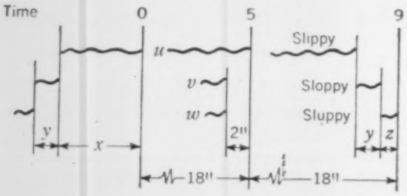

Fig. 1. Sluppy Wins the Vermithon by a Length.

"Joe doesn't know a worm when he sees one," objected Cal Klater. "An inchworm is not a worm, but an insect, and it can't travel at constant speed anyway. Any helminthologist could tell an entomologist that. Furthermore, Noah didn't say the three worms were the same length. Suppose we let x, y, z be the lengths and u, v, w, the speeds of Slippy, Sloppy and Sluppy respectively, we can write 6 distance equations:

$$\begin{aligned} 5u &= 18 & 4u &= 18 - y - z \\ 5v &= 16 + x & 4v &= 20 - z \\ 5w &= 16 + x + y & 4w &= 20 \end{aligned}$$

and find $x = 7$, $y = 2$ and $z = 1.6$ in. Any one of those 3 lengths is the answer to the indefinite question, 'How long is a worm?'"

"Can I point out a paradox?" asked Ken Bridgewater. "We can also find $u = 3.6$, $v = 4.6$ and $w = 5$ ipm and say generally that the briefer the worm the squirmier, which has the paradoxical corollary that the slower the worm the more ground he covers. I suspect Slippy is *lumbricus terrestris*, the lawn earthworm, from his length and ambling gait, but he hasn't even prehensile heels. Heels mean feet and feet mean legs and worms with legs are insects, so Sloppy and Sluppy could be hornworms or inchworms, which move fast when prodded."

"I just call them worms, Ken, and Cal is right, of course. Joe just tried to make an easy problem hard, like the chap who was asked in an examination for registration to compute the power required to raise a weight of one ton 495 ft in 18 sec. Suspicious of this setup for 100 hp, our hero computed 105 hp by assuming a standing start and a coasting stop, which suggests a nice problem. Instead of 18 sec, what time should have been specified so that our hero's answer would have been double the usually accepted solution?"

[*Worm experts were many: E. P. Goodrich (who identified them in Latin), Ed C. Holt, Jr., Robert W. Woodbury, John L. (Stoop) Nagle, X. L. A. Bridger (Ralph Stewart), Homer W. Woodbury, M. L. Button, Richard Jenney, J. Barnsworthy Pipsqueak (Wm. C. Strasser), Victoria Masce (J. S. Kendrick), Sligh Drewel (Warren M. Hubbard), David C. Harris, A. Bodenstein, A. Nuther Nutt, John L. S. Hickey, A. Sackheim, Bill Durr (Coleman W. Jenkins), R. E. (Sluppy) Philleo and John C. Prior. All noted the inverse speed relation and Harris spotted the paradox. Finalists on the December literary problem were Goodrich, Holt and Harris.*]

Meetings and Conferences

American Chemical Society. Technical advances in irrigation, the study of viruses and other major fields of chemical science and technology will be described in the papers to be presented at the national meeting of the American Chemical Society in San Francisco, Calif., March 28–April 1.

American Geophysical Union. General and technical sessions are planned for the 30th annual meeting of the American Geophysical Union, Washington, D.C., April 20–22. The 24th regional meeting will be held at Denver, Colo., jointly with the Western Snow Conference, on April 26-27.

American Institute of Architects. Headquarters for the annual meeting of the American Institute of Architects will be the Rice Hotel, Houston, Tex., March 15–18.

American Institute of Electrical Engineers. The southwest district meeting is scheduled to be held at the Baker Hotel, Dallas, Tex., April 19 through 21.

American Railway Engineering Association. A meeting of the American Railway Engineering Association is scheduled for the Palmer House, Chicago, Ill., March 15-17.

American Society of Tool Engineers. The 17th annual meeting is scheduled for Pittsburgh, Pa., March 10–12.

American Welding Society. Every phase of welding will be covered at the 10th meeting of the Ohio Welding Conference, which will take place on the Ohio State University campus, Columbus, Ohio, April 7 and 8. Inquiries should be addressed to the Department of Welding Engineering, Ohio State University, Columbus 10, Ohio.

Chicago Technical Societies Council. The seventh Chicago Production Show and Technical Conference, sponsored by the Chicago Technical Societies Council, is to take place at the Stevens Hotel, Chicago, Ill., March 14–17. Inquiries should be addressed to Edward C. Bowman, General Manager, 8 South Michigan Avenue, Chicago 3, Ill.

Engineers' Council of Houston. "The Conservation of our Natural Resources" is the theme of the second annual symposium of the Engineers' Council of Houston, to be held at the Rice Hotel, Houston, Tex., April 2.

Midwest Power Conference. The 11th annual meeting of the Midwest Power Conference is to be held at the Hotel Sherman, Chicago, Ill., April 18–20.

National Association of Corrosion Engineers. A meeting of the National Association of Corrosion Engineers will take place at the Netherlands-Plaza Hotel, Cincinnati, Ohio, April 11–13.

National Rivers and Harbors Congress. Development of the nation's water and land resources will be the main topic of discussion at the 39th annual convention of the National Rivers and Harbors Congress, to be held in Washington, D.C., April 7-9.

Society of Automotive Engineers. The aeronautic and air-transportation division of the Society of Automotive Engineers will meet at the Hotel New Yorker, New York City, April 11–13.

Third International Lighting Exposition and Conference. Newest developments in industrial and commercial lighting equipment will be displayed as well as discussed at the Third International Lighting Exposition and Conference, sponsored by the Industrial and Commercial Lighting Equipment Section of the National Electrical Manufacturers Association, and scheduled for the Stevens Hotel, Chicago, Ill., March 29–April 1.

Lower Excavation Costs

Substantial savings in excavation costs are often possible with Transite* Sewer Pipe because of its high flow capacity. This often permits the use of flatter grades and shallower trenches. This is a particularly important advantage where the pipe must be laid at or below the ground water line or where rock excavation is involved.

As an alternate economy, designers may take advantage of Transite's high flow capacity by specifying smaller diameter pipe.

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NEW IN Education

Municipal Problems Studied in Illinois U. Laboratory

A COMPREHENSIVE INVESTIGATION of Boneyard Creek, a small stream that menaces the twin cities of Champaign and Urbana, Ill., with periodic flood rises, is being undertaken by the University of Illinois Hydrological Laboratory of the Department of Civil Engineering, as a fundamental study in applied hydrology. An urban area of some 4.5 sq miles will be the subject of a long-time study, covering time and volume relations between rainfall and runoff and the correlation of runoff percentages with seasonal, climatic, and meteorologic factors.

The Hydrological Laboratory is equipped with the latest type of hydrologic instrumentation, including nine recording rain gages that will afford relatively dense coverage of the watershed; three Price current meters for streamflow measurement; a modern river-gaging station with concrete control; and an automatic stage recorder housed in a concrete shelter.

J. J. Doland, M. ASCE, professor of civil engineering, is in charge of the laboratory, with Milton O. Schmidt, Assoc. M. ASCE, as his assistant.

BIDS WILL SOON be opened for construction of a $975,000 Geophysical Institute at the University of Alaska, according to the Public Buildings Administration. The new structure will house the "listening post" into scientific research and experiments the university has conducted since 1941 for the Army, the Federal Communications Commission, the Coast and Geodetic Survey, and the Weather Bureau. Of anti-seismic construction, the institute will be three stories in height, with a penthouse for accommodation of scientific recording and experimental equipment and an astronomical dome to house a 10-in. reflecting telescope. The listening post is being expanded and its functions added to the curriculum.

A SECOND SYMPOSIUM on Plasticity will be held at Brown University, Providence, R.I., April 4–6, under joint sponsorship of the Bureau of Ships and the Office of Naval Research, Department of the Navy. The two principal topics under consideration will be "Structural Applications of the Theory of Plasticity" and "Dynamic Problems of Plasticity," with approximately a day devoted to miscellaneous contributions to theoretical or experimental phases of plasticity. Further information may be obtained from Prof. P. S. Symonds, Graduate Division of Applied Mathematics, Brown University, Providence 12, R. I.

APPLICATIONS FOR TWO $2,400 scholarships for undergraduate study at Rensselaer Polytechnic Institute during the college year starting in September 1949 will be received by the Rensselaer Alumni Association until April 1. One of these scholarships, which cover full tuition for four years of study, will be granted to a secondary school student residing in Cuyahoga County, Ohio; the other to a secondary student from any other part of Ohio. Application blanks may be obtained from school principals.

Bridge Strain Tested in Dartmouth College Laboratory

LOAD STRESS ON MODEL OF PROPOSED MONONGAHELA RIVER BRIDGE, designed and built in laboratory of Thayer School of Engineering at Dartmouth College, is checked on strain gages by J. H. Minnich (right), Assoc. M. ASCE, professor of civil engineering. At left, Edmund J. Byrkit, Jun. ASCE, adjusts loading weights. Model is equipped with Baldwin-Southwark SR-4 electric strain gages. Photo through courtesy of "Dartmouth Alumni Magazine."

New Publications

Research, Housing. Results of tests on the mechanical and physical properties of several types of flooring materials, particularly as to load and surface wear resistance, together with moisture and aging characteristics, are given in Technical Paper 11, *Properties of Experimental Wood-Base House Flooring Materials*, published by the Housing and Home Finance Agency. The tests were sponsored by the HHFA at the Forest Products Laboratory of the U.S. Forest Service. Inquiries should be addressed to the HHFA, Office of the Administrator, Washington 25, D.C.

Expressways. New York City's arterial highway program, in both the planning and construction stages, is detailed in a graphically illustrated brochure entitled *N.Y.C. Parkways, Expressways, Arterial Highways*. Copies may be obtained free of charge from the Office of City Construction Coordinator, Randall's Island, New York 35, N.Y.

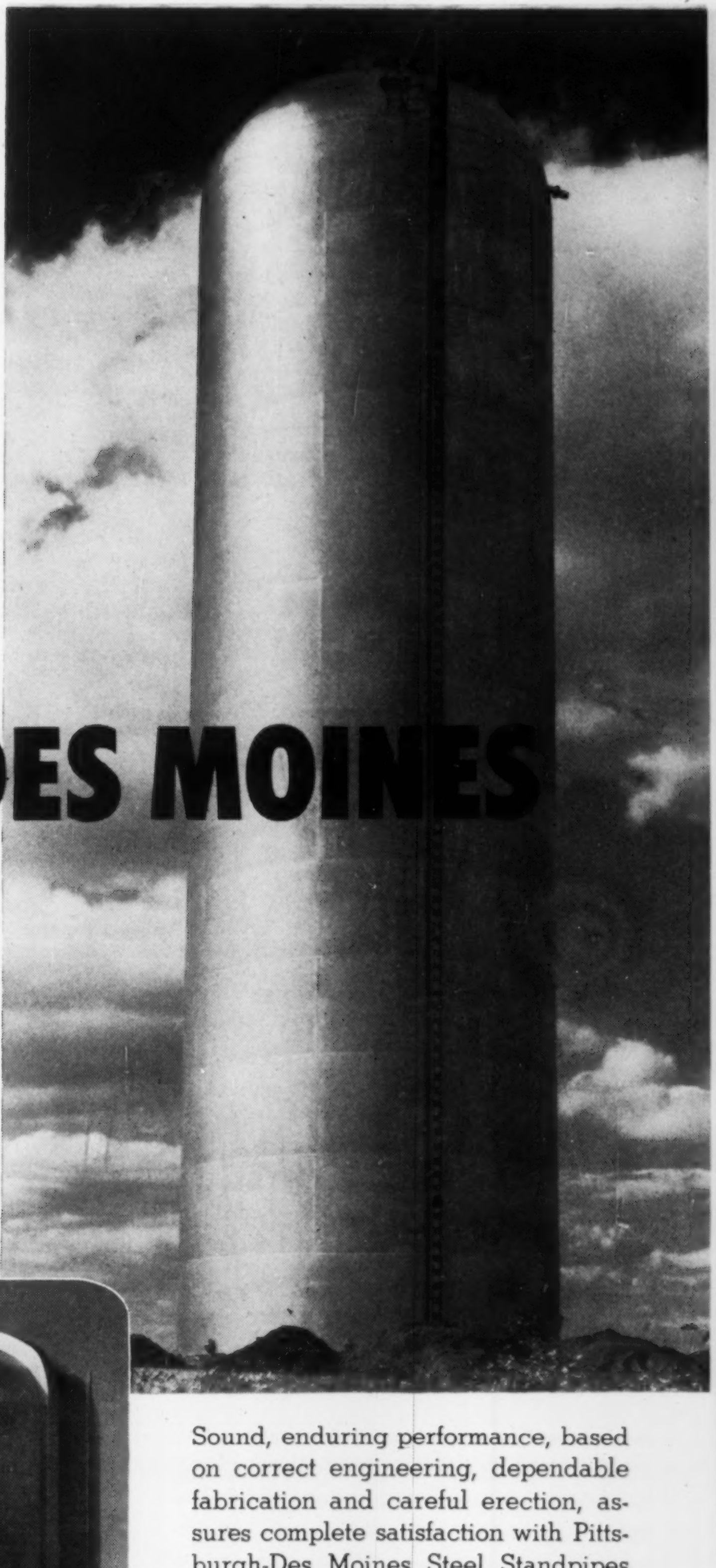
River Protection. Experiences of the public works and other government departments in New Zealand in the use of willows and poplars for river-protection work and soil-conservation measures have been utilized in the compilation of Bulletin 6 of the Soil Conservation and Rivers Control Council, Wellington, N.Z. Inquiries concerning the 71-page illustrated booklet should be sent to the Soil Conservation and River Control Council.

Technion Yearbook. Papers by ASCE members Alfred M. Freudenthal, recent winner of the Norman Medal, Jacob Feld, and many other distinguished engineers and scientists are included in the *1948 Technion Yearbook*, which is published by the American Technion Society at 154 Nassau Street, New York 7, N.Y. In addition to Mr. Feld, the editorial board includes Jacob Mark and Raymond D. Mindlin, Members ASCE. Copies are free to members of the American Technion Society, and $2.50 to others.

Construction. Public construction since the war is summarized in booklet No. 8 of the Construction Industry Information Committee of the Producers' Council. For copies write the Committee at 815 Fifteenth Street, N.W., Washington 5, D.C.

Port of New York. With the issuance of the February 1949 number of *Via Port of New York*, the Port of New York Authority launches publication of a new monthly that will emphasize new port facilities for ocean, rail, air, and truck shipping. Regulations and rates and other important matters will also be covered.

(*Continued on page 72*)



FOR ECONOMICAL

Water Storage

AT NATURAL ELEVATIONS

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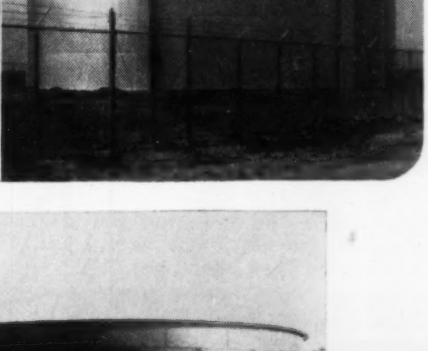
Reservoirs



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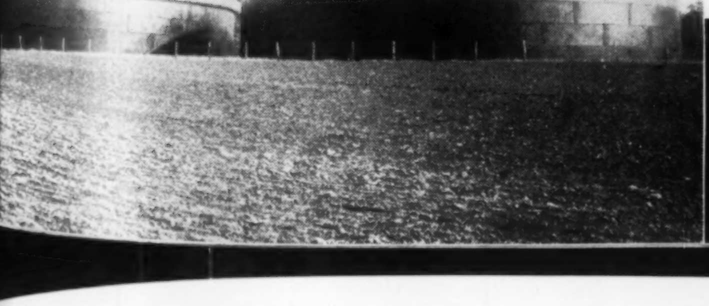

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(*Continued from page 70*)

Research. Technological research programs conducted at the Armour Research Foundation of Illinois Institute of Technology during the past year are described in the Foundation's 1948 Annual Report. More than 110 industrial organizations and 20 government agencies sponsored these projects, which totaled $3,380,000, an increase of 25 percent over the preceding year.

UNESCO. Current news reports regarding UNESCO activities in this country and abroad are listed in a monthly bulletin of the UNESCO Relations Staff, entitled *National Commission News*. This publication is for sale by the Superintendent of Documents, Government Printing Office, Washington 25, D.C., at a subscription of $1 a year. The National Research Council issues at irregular intervals a bulletin, *Science in UNESCO*, copies of which may be obtained free of charge either directly from the Council, or from the office of the chairman at the Harvard University Observatory, Cambridge 38, Mass.

Soil Mechanics. Eight papers—sponsored by the Highway Research Board's Committee on Surveying and Classifying Soils in Place for Engineering Purposes and presented at the 27th annual meeting of the Board—are now available in Bulletin No. 13, *The Appraisal of Terrain Conditions for Highway Engineering Purposes*. The papers indicate some of the methods developed for making appraisals of terrain conditions and show how such information can be obtained quickly and at reasonable cost. Authors include ASCE members Gerald Fitzgerald, D. J. Belcher, and P. L. Melville. Requests for copies should be sent to the Highway Research Board, 2101 Constitution Avenue, Washington 25, D.C.

Water Resources, Wyoming. Investigations on Bear River, which have been carried on for several years by cooperative agreement between the States of Utah, Idaho, and Wyoming and the Bureau of Reclamation, are listed in the 29th biennial report of the State Engineer to the Governor of Wyoming for the biennium 1947–1948. The 80-page bulletin also includes reports of the water division superintendents on supply and administrative problems for the period. L. C. Bishop, M. ASCE, state engineer of Wyoming, is author of the bulletin.

Timber Structures. Comprehensive coverage of many commonly encountered structural problems, involving all types and spans of roof trusses as well as many special designs, is provided in the 1949 edition of *Typical Designs of Timber Structures*, issued by the Timber Engineering Co. The present edition—prepared under the direction of James H. Carr, Jr., Assoc. M. ASCE, and Ralph H. Gloss—includes 88 new, typical designs and numerous illustrations. Complimentary copies will be distributed while the supply lasts to practicing engineers and architects who write on their firm letterhead to Timber Engineering Co., 1319-18th St., N.W., Washington 6, D.C. To others the price is $10.

Research, Southeast. To promote the technological development of the Southeast through scientific research, a group of 14 outstanding scientists in the area is serving on the advisory board of a new scientific journal that will record technological progress in eleven Southeastern states. Entitled *The Journal of Southeastern Research*, the new publication will record the achievements of many rapidly expanding research centers in the area, including several great new federal research laboratories, numerous growing university laboratories, and more than 200 research laboratories operated by industrial concerns. Further details may be obtained from the Southeastern Research Institute, Inc., 5009 Peachtree Road, Atlanta, Ga.

Hydraulic Research. A compilation of stages and discharges on the Mississippi River and its outlets and tributaries for the year 1945 has been made available in a 285-page paper-bound volume by the Mississippi River Commission, Vicksburg, Miss. Copies may be purchased from the Commission at 75 cents each.

Beach Erosion. Issuance of several technical bulletins of the Beach Erosion Board has been announced by the Army Corps of Engineers. These include Technical Report No. 3, describing an experimental study of submarine sand bars; Technical Memorandum No. 6, on *An Ocean Wave Measuring Instrument;* and the January 1941 Bulletin of the Board, featuring "A Formula for the Calculation of Rock-Fill Dikes." Inquiries should be addressed to the Beach Erosion Board, Office of the Chief of Engineers, Washington, D.C.

Library Research. Helpful procedures for locating data in the various forms of technical literature, such as books, serials, journals, government publications, and trade catalogues, are outlined in "Use of a Technical Library," by Robert H. Whitford and John B. O'Farrell, of the City College technological library staff. Originally published in the December 1948 issue of *Mechanical Engineering*, this material is now available in reprint form from the ASME, 29 West 39th Street, New York 18, N.Y. Copies are 25 cents to ASME members, and 50 cents to others.

Housing. To provide users of housing statistics with current information on housing production, construction costs, home financing, and public housing, and to bring up to date the basic statistical charts and tables issued annually in the *Housing Statistics Handbook*, the Housing and Home Finance Agency has initiated publication of a new monthly entitled *Housing Statistics*. Information concerning the new publication may be obtained from the HHFA, Washington, D.C. The *Housing Statistics Handbook* is available through the Superintendent of Documents, Government Printing Office, Washington 25, D.C., at a cost of $1.

Foreign Publications. Current scientific and technical works by leading European engineers and scientists may be obtained from the recently established Newton Publishing Corp., 114 East 32nd Street, New York 16, N.Y., sole agent in the United States for the Swiss publishing house, Verlag Birkhauser, Basle.

Construction. Continuing its survey of construction materials in Kansas, the Kansas Highway Commission and U.S. Geological Survey have issued a report on *Construction Materials in Smith County, Kansas.* The report, listed as Circular 25, may be obtained from the Department of the Interior, Washington, D.C.

Precast Concrete. A second edition of *Structural Precast Reinforced Concrete*, by Kurt Billig, consultant to the British Ministry of Works, has been issued in mimeographed form by the London Cement and Concrete Association. Copies, at $6 each, may be obtained from the American publisher, F. Fritz Billig, Jamaica 3, N.Y.

Public Health. A directory of state and territorial health authorities for 1948 is now available as Supplement No. 180 to the Public Health Reports of the Public Health Service. Copies are for sale at 15 cents each by the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C.

Concrete. Current researches of the Portland Cement Association in the field of portland cement and concrete are detailed in a brochure entitled *Handbook of Frame Constants*. Also available from the same organization is a *Cement and Concrete Reference Book for 1948*, a compilation of interesting facts about the history, manufacture, and uses of portland cement and concrete. Inquiries concerning both publications should be addressed to the Portland Cement Association, 33 West Grand Avenue, Chicago 10, Ill.

Steel Products. Another section in the Steel Products Manual, being issued in installments by the American Iron and Steel Institute, is now available from the Institute, 350 Fifth Avenue, New York 1, N.Y., at a cost of 25 cents postpaid. The present brochure deals with *Carbon Steel Structural Sections.*

Mapping. The Mississippi River Commission announces that due to increasing costs of labor and materials the price of its Folio of Navigation Maps of the Mississippi River, Cairo, Ill., to the Gulf of Mexico, 16th edition, dated January 1948, will be $2 per folio.

Highway Safety. Reprints of a talk, entitled *Round-Up of What's New in Traffic Safety*, presented by Norman Damon at the National Safety Congress in Chicago in October 1948, have been made available by the Automotive Safety Foundation, 700 Hill Building, Washington 6, D.C.

Atomic Energy. A compilation of Atomic Energy Commission Documents now ready for public sale may be obtained from the Technical Information Branch, Atomic Energy Commission, Oak Ridge, Tenn.

Manufacturers' Register. Information about nearly 6,000 British manufacturers and their products is given in the 1948–1949 edition of the Federation of British Industries *Register of British Manufacturers*. The 752-page compilation also includes a classified "Products and Services" section, which lists more than 5,000 trade headings, facilitating the rapid identification of supply sources. Copies may be obtained from the publisher, Iliffe & Sons, Ltd., Dorset House, Stamford Street, London S.E. 1, at 42 s. a copy. Overseas postage is 1s. 6d.

(*Continued on page 74*)

"FORD F-8 Big Jobs outperform all other trucks in their class!"

Roadside Report

FORD Bonus Built TRUCKS

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SERVICE ENTRANCE
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"MY BONUS BUILT Ford F-8 Big Jobs, averaging 46,000 lbs. gross, are outperforming all other trucks in their class," reports Mr. James L. Diggs. "Gas mileage is 6 miles per gallon. The engine on one F-8 has never felt a wrench, except for changing one set of points and two fan belts. My run takes us over a mountain range and through the intense heat of the Colorado River Valley."

Mr. Diggs is one of many big-time haulers who give the Ford Big Jobs a great big hand. Owners report the 145-horsepower engine outperforms anything in its class. They offer plenty of proof that it outsaves many engines much smaller in size. Drivers report that the new Ford Million Dollar Cab can't be beat for comfort. Ford Big Jobs for '49 are Bonus Built . . . like the other 139-plus models in the full line of Ford Trucks. Bonus Built is the superstrong construction that contributes to long truck life. Life insurance experts prove Ford Trucks last longer.

ONLY THE FORD BIG JOB

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★ **New 145-h.p. Ford V-8 engine for top performance.**

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★ **Ford Super Quadrax 2-speed axle with vacuum shift for performance flexibility in Model F-8 (single speed axle also available); single-speed Quadrax Hypoid Axle in Model F-7.**

★ **Large diameter (10-inch) wheel bolt circle with 8 studs to allow for extra-strong hub construction.**

★ **Million Dollar Cab with Ford Exclusive Level Action suspension for greater driving comfort.**

★ **Nationwide service from over 6,400 Ford Dealers.**

★ **Ford Bonus Built construction for long truck life.**

Gross Vehicle Weight Ratings: F-8 up to 21,500 lbs., F-7 up to 19,000 lbs. Gross combination ratings: F-8 up to 39,000 lbs., F-7 up to 35,000 lbs.

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USING LATEST REGISTRATION DATA ON 5,444,000 TRUCKS, LIFE INSURANCE EXPERTS PROVE FORD TRUCKS LAST LONGER!

(*Continued from page 72*)

Ground-Water Flow. A report describing methods for the solution of problems of ground-water flow in buried channels or other water-bearing formations of limited areal extent has been released by the U.S. Geological Survey as Technical Report No. 1. Entitled *Ground-Water Hydraulics as a Geophysical Aid*, the report is one of a series prepared by the Survey in cooperation with the Geological Survey Division of the Michigan Department of Conservation. Copies are available for distribution from the Geological Survey Division of the Michigan Department of Conservation, 205 Capitol Savings and Loan Building, Lansing 68, Mich.

Hydraulic Engineering. A mathematical method for the computation of tidal levels and flow in tidal rivers and estuaries is detailed in "Le Calcul du Mouvement non Permanent dans les Rivières par la Methode dite des 'Lignes d'Influence,' " by H. Holsters. The paper, which is reprinted from *La Revue Generale de l'Hydraulique*, may be consulted in the Engineering Societies Library, 29 West 39th Street, New York 18, N.Y.

Mining Engineering. The American Institute of Mining and Metallurgical Engineers is launching *Mining Engineering*, a new monthly that will replace *Mining and Coal Technologys* and *Mining and Metallurgy*, official AIMME publication for the past 29 years. The first issue (January 1949) of the new publication, which has the aim of keeping "the mining industry posted on developments in operating technique, progress in research, and trends in mineral economics and labor relations," includes an article by ASCE Director Julian W. Hinds on water as a low-cost but highly important industrial mineral.

Standard Letter Symbols. A new publication in the series of standard letter symbols for use in technical and scientific writing, *American Standard Letter Symbols for Physics, Z10.6-1948*, is obtainable from the American Standards Association, 70 East 45th Street, New York 17, at $1 a copy. The standard was developed by a committee under sponsorship of the Founder Societies, the American Association for the Advancement of Science, and the Society for the Promotion of Engineering Education.

Highway Maintenance. To improve winter maintenance service on highways affected by snow and ice, the Highway Research Board has issued a second revision of No. 9-2R, entitled *Recommended Practice for Snow Removal and Treatment of Icy Pavements*. The bulletin, which continues the Board's research series on current road problems, may be obtained from the Highway Research Board, 2101 Constitution Avenue, Washington 25, D.C.

Government Standards. All publications of the National Bureau of Standards from 1901 to June 30, 1947, are listed in Circular 460, which can be obtained from the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C. The 375-page publication sells for 75 cents.

Soil Mechanics. With issuance of the June 1948 number of *Geotechnique*, the Geotechnical Society of London launched a new quarterly devoted to significant developments in the fields of soil mechanics, engineering geology, and foundation engineering. Subscriptions at the rate of one pound a year may be forwarded to the Society at 123 Victoria Street, London S.W.1. Subscriptions may also be sent in American money, at the rate of $4.03, through Ralph B. Peck, Assoc. M. ASCE, research professor of soil mechanics at the University of Illinois, Urbana, Ill., who is temporarily acting as American editor of the publication.

Flow of Fluids. Convenient and usable tables and charts on pipe friction comprise a Tentative Standard on Pipe Friction, which has been made available by the Hydraulic Institute, 90 West Street, New York 6, N.Y. Friction loss for water is shown for pipe sizes from $^1/_8$ to 84 in. in diameter, and for computing the friction loss for liquids other than water a series of charts shows the complete range of viscous and turbulent flow for pipes from $^1/_2$ to 12 in. in diameter. In addition, there is a complete listing of the losses in valves and fittings. Copies of the Standard may be purchased from the Institute at $1.50 each.

◆

Charts for Footing Design Developed from Soil Studies

(*Continued from page 44*)

structure and resulting cracking will be minimized. Separate charts may be made for different footing shapes; however, the chart derived for square footings may be used for rectangular or other shapes with little error.

A third type of chart, Fig. 3, shows footing width as a function of column load. This chart is derived from the first chart in a manner similar to the second by plotting the footing width as ordinate and the column load as abcissa. However, since a chart derived for one footing shape is not applicable to other shapes, even as an approximation, the use of this form is limited.

The three charts illustrating this article were derived for square footings, resting on a bed of sand 20 ft thick which overlies a stratum of soft, compressible clay. In one case the water table is assumed to be at the level of the footings; in the second, the water table is assumed to be far below the level of the footings.

This method of representing the data from soil studies was developed as a part of the foundation investigation for a large hospital made for I. E. Morris, M. ASCE, structural engineer, Atlanta, Ga.

NEWS OF Engineers

William R. Seeger, who has been serving the Marin Municipal Water District, San Rafael, Calif., as assistant chief engineer, has accepted the position of assistant general manager in the same district office.

Thorndike Saville, dean of the College of Engineering at New York University, has been appointed sanitary engineering member of the National Advisory Health Council. The Council, made up of ten representatives of professions concerned with public health, advises the Surgeon General and examines federal grants for special research. Dean Saville is also a member of the New York State Public Health Council.

George H. A. Parkman, Jr., has resigned as director of building construction and maintenance, Westinghouse Electric Corp., to assume the presidency of the Mountaineer Engineering Co., a contracting and engineering firm, with headquarters at Pittsburgh, Pa., and branch offices at Fairmont, W.Va., and Mansfield, Ohio.

John C. Norton announces the moving of his office from Royal Oak to Traverse City, Mich. Complete engineering services in municipal engineering, airport planning, structural design, and investigation are offered by his firm.

Alexis J. Mortola, director of the Queens County, New York, chapter of the New York State Society of Professional Engineers, Inc., has been made engineer-in-charge, Division of Substructures, in the office of Borough President James Burke.

Linwood G. Mort, a partner in the firm of Argraves and Mort, consulting engineers of New Haven, Conn., and New York City, has been granted a leave of absence to assume, on a temporary basis, the post of director of the Real Assets Division of Connecticut. The Real Assets Division of the Comptroller's office has charge of the design, supervision of construction, and maintenance of all state buildings and institutions.

Wendell R. LaDue, chief engineer and superintendent of the Water and Sewerage Department of Akron, Ohio, has completed 30 years of service as a city employee. He returned to Akron as junior engineer in 1919, after serving in the Navy Civil Engineer Corps during the first World War. Mr. LaDue is past-president of the American Water Works Association.

W. Harry Hudson, Jr., who has been assistant division engineer for the St. Louis Southwestern Railway Co., has accepted the appointment of assistant chief engineer of the same company with headquarters at Tyler, Tex.

(*Continued on page 76*)

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For more than 100 years sanitary engineers have selected and specified concrete pipe for sanitary sewers because it meets all three essential requirements: (1) strength to resist severe impact and to sustain heavy overburdens, (2) durability to render many long years of heavy-duty service and (3) true ***low-annual-cost*** economy.

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Concrete pipe renders outstanding service in storm sewers because it carries off water efficiently. Its smooth, interior finish provides maximum hydraulic capacity and resists the wearing action of abrasive matter. Concrete storm sewer pipe is economical because it's moderate in first cost, has a long life and little or no maintenance cost. That's ***low-annual-cost*** service.

WATER LINES

Concrete pipe is ideal for water lines because (1) it can be designed to resist high internal pressures, (2) its joints can be made watertight, (3) there is no tuberculation and far less incrustation to impair hydraulic capacity and (4) it minimizes taste, odor and dirty water difficulties. Its reasonable first cost, combined with low upkeep and long life, give ***low-annual-cost*** service.

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(*Continued from page 74*)

George S. Salter is now filtration design engineer in the Filtration Design Division of the City of Chicago, for which he is engaged on the preliminary design of a 950-mgd plant. Mr. Salter served as Mid-West Representative of the Society from October 1946 until the closing of the Chicago field office in December 1948. He has been active in the Illinois Section and recently completed a term as president, and at present, he is serving on the ASCE Committee on Local Sections. At its January meeting the Board of Direction passed a resolution of appreciation for Mr. Salter's work as Mid-West Representative.

George S. Salter

Clifford M. Hathaway was recently appointed chief highway engineer of the Illinois Division of Highways, a promotion from the position of engineer of construction, which he had held since 1922.

Henry Lewis Guy, secretary since 1941 of the Institution of Mechanical Engineers, Great Britain, was elevated to the knighthood by King George VI at recent ceremonies. Sir Henry began his engineering career in 1910 as a member of the mechanical department of the British Westinghouse Co., and in 1918 became chief engineer of the mechanical department of its successor, the Metropolitan-Vickers Electric Co.

Thomas B. Henry announces the addition of **George N. Schoonmaker, Leon G. Williams, Spencer D. Downing,** and **Bernal H. Swab** to the staff of Jones & Henry, Toledo sanitary engineering firm. The firm name will be changed to Jones, Henry & Schoonmaker.

Carl W. Brown, Missouri state highway engineer, has succeeded **Wesley W. Polk,** of Illinois, as president of the American Association of State Highway Officials in accordance with the constitutional provisions of the association. Mr. Brown has been with the Missouri State Highway Commission for more than 40 years. Long active in the AASHO, he served recently as vice-president.

Odd Albert was recently made associate professor of civil engineering at the Polytechnic Institute of Brooklyn, in the field of structures and structural analysis.

Victor W. Anckaitis, for the past 20 years borough engineer of Wilson Borough, Pa., has also been named city engineer of Easton, Pa. Since 1946, Mr. Anckaitis has held the chairmanship of the city planning commission. He is a graduate of Lafayette College.

George E. Barnes, head of the Department of Civil Engineering and Engineering Mechanics, Case Institute of Technology, has been appointed consulting engineer to the engineering firm of Parsons, Brinckerhoff, Hall and Macdonald of New York City, associated with Damon, Dinerman & Cia S.A., of Buenos Aires, to advise on hydroelectric projects of the Argentinian government on the Salado and Juramento rivers. Professor Barnes will go to Argentina during the coming summer, when the country is experiencing its rainy season and customary flood conditions. He will review hydrological and silt measurements and make recommendations on river training and provisions for desilting of streams to conserve future reservoir capacity.

George A. Taylor announces the addition of **William P. Sanzenbacher** to the staff of Forster, Wernert, Taylor & Fred M. Morris, Toledo engineers and architect. The firm name will be changed to Wernert, Taylor, Sanzenbacher & Morris.

A. A. Brielmaier, formerly on the faculties of the University of Illinois and Pennsylvania State College, has accepted a professorship in civil engineering at Washington University in St. Louis, Mo., where he will teach courses in structural engineering.

Theodore J. Kauer has assumed new duties as director of highways in Ohio, with headquarters at Columbus. Mr. Kauer was previously with the American Concrete Pipe Association in the capacity of assistant managing director, and more recently has been managing director of the Wire Reinforcement Institute.

S. W. Sparrow, vice-president in charge of engineering for the Studebaker Corp., South Bend, Ind., took office as president of the Society of Automotive Engineers for 1949 at the recent annual meeting, succeeding **R. J. S. Pigott,** of the Gulf Research and Development Co.

N. W. Haner announces the establishment of a civil engineering office in Portland, Ore., for consulting and design services, with specialties in the fields of municipal engineering, water and sewage works, structural engineering, bridges, buildings, and special structures.

Jack Pierce is now in the design section of the East Bay Municipal Utility District, Oakland, Calif. Previously he was with the State Division of Water Resources, making ground-water investigations in the Yuba Sutter area.

ASCE Member to Head Mississippi River Commission

Nomination of Brig. Gen. Peter A. Feringa as president of the Mississippi River Commission has been confirmed by the Senate. In this capacity he will succeed Maj. Gen. R. W. Crawford who has retired to become executive vice-president of the Lower Mississippi Valley Flood Control Association. General Feringa will also serve as division engineer of the Lower Mississippi Valley Division of the Corps of Engineers.

Gen. P. A. Feringa

J. Charles Rathbun has retired from th City College of New York staff after 1 years on the engineering faculty, with th rank of professor emeritus. Professo Rathbun has contributed to ASCE numerous articles o the history of engineering and othe subjects, includin the elastic ske arch theory used i grade separations which he is credite with originating an developing. Professor Rathbun ha been a consultant o the skew arch for th Westchester County Park Commission an the Connecticut State Highway Department. Before going to City College, h was on the faculties of the University o Washington, South Dakota State Schoo of Mines, and Antioch College.

J. Charles Rathbun

Carl M. Bennett succeeds **Frank O. Ray,** who has retired as city engineer for Colorad Springs, Colo. Mr. Ray will continue to b with the department as a consultant. Prior to serving as assistant city engineer o Colorado Springs, Mr. Bennett was directo of public works and planning for Grand Junction, Colo. He is a veteran of thre years of duty in the U.S. Navy.

Harold H. White has resigned as minin engineer and special representative for th Atlas Powder Co., Joplin, Mo., to take charge of a newly created consulting firm composed of a group of Texas engineers and scientists. The new organization will have its main offices in Houston, with branches to be opened in New York, Cleveland, and Chicago. The control of blasting for settled areas and the measurement of vibration from blasting will be its major field of operation.

Vernon Bengal, formerly with the Central California Mutual Water District of Los Banos, is now employed by the Division of Water Resources in Sacramento, Calif.

William R. Hunter, recently of Fort Worth, Tex., has opened a consulting office for the practice of civil engineering at Greenville, Tex. Mr. Hunter has been with Freeze & Nichols, Fort Worth engineers, and will continue to be associated with them in a consulting capacity on large projects.

Dudley Stevens, until recently on the staff of *Western Construction News,* has accepted the position of assistant traffic engineer in the Engineering Department of the City of Sacramento, Calif.

Willard E. Simpson, president of W. E. Simpson Co., consulting engineers, San Antonio, Tex., was recently honored by being elected to membership on the Public Service Board of the City of San Antonio.

Asa G. Proctor, of Woodland, Calif., has been reappointed to the State Board of Registration for Civil and Professional Engineers for a four-year term.

(*Continued on page 78*)

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(Continued from page 76)

Ezra B. Whitman, past-president of ASCE and consulting engineer of Baltimore, Md., has been elected president of the American Institute of Consulting Engineers. For several years Mr. Whitman was chief engineer and president of the Water Board of Baltimore and, as senior partner in the firm of Whitman, Requardt and Smith since 1925, he has specialized in the design and construction of sewerage disposal plants and water supply systems. In the present war his firm was engineer-architect for huge chemical warfare projects at Edgewood, Md., Huntsville, Ala., and Denver, Colo. Active in the field of public service, he has been on various engineering commissions including the Public Service Commission of Maryland, the Engineer Board of Review of the Sanitary District of Chicago, and the Maryland State Roads Commission. He has served the Society in many capacities including a term as Director from 1923–1925.

Ezra B. Whitman

William J. Wenzel recently resigned the post of director of public works, Great Falls, Mont., which he had held since May 1947, to establish a private engineering practice in Great Falls. Needed city improvements were made during his tenure as director of public works.

Arthur R. Watson, formerly with C. S. Replogle of Oakland, Calif., is now with the Division of Architecture, State Division of Highways, Sacramento, Calif.

Othmar H. Ammann and **Charles S. Whitney** announce the reorganization of the consulting firm of Ammann & Whitney, with the following staff members becoming associate partners: **Milton Brumer, Werner Ammann, Boyd G. Anderson,** and **James S. Whitney.**

Arthur H. Castelazo, who is in the Civil Engineer Corps of the Navy, has been transferred from Bremerton, Wash., to Adak, Alaska, where he will be the Officer-in-Charge of the 124th Naval Construction Batallion.

Gordon Long recently transferred from the Division of Water Resources of the State of California, Sacramento, Calif., to the Division of Highways in the same office.

L. O. Hopkins, previously chief engineer of the Nashville Bridge Co., Nashville, Tenn., has accepted the position of consulting engineer and assistant engineer of the Harrison County (Mississippi) Commission. Mr. Hopkins' work will be on movable and mechanical draw span bridges in the county.

Frank M. Williamson, since 1946 design engineer for the Sanitary Authority of Allegheny County, Pennsylvania, is to become affiliated with Gannett Fleming Corddry and Carpenter, Inc., in the capacity of sanitary engineer responsible for the sanitary section at Pittsburgh, Pa. Mr. Williamson served the Sanitary District of Chicago for about 20 years, and during World War II was sanitary engineer with the military government in Okinawa and Korea.

H. J. Brunnier, consulting structural engineer of San Francisco, Calif., has gone to Japan, at the request of the American Association of Seismology and with the cooperation of the Army, to investigate the effects of the Fukuii earthquake.

Norman D. Kenney became a member of the staff of the consulting firm of G. Douglas Andrews Associates, Towson, Md.

V. M. Ehlers, chief sanitary engineer of the State Board of Health, Austin, Tex., has been elected president of the Federation of Sewage Works Associations, succeeding **George F. Russel,** St. Louis consultant.

V. M. Capesius has resigned from the post of city engineer of Ventura, Calif., to go into private practice there with **Donald Knight,** former city building inspector.

Vincent K. Cates, formerly manager of the Logan International Airport at East Boston, Mass., will join the Navy Civil Engineer Corps in a civilian status.

E. J. Niemen, with the Bureau of Reclamation at Coulee City, Wash., has been appointed resident engineer for the Soap Lake Siphon. He served in the Corps of Engineers during the recent war.

Henry TenHagen will continue to serve the Rochester, N.Y., District of the Corps of Engineers as acting district engineer.

Desso T. Mitchell, of Columbus, Ohio, succeeds **Grover T. Clements** as sanitary engineer for Franklin County, Ohio.

M. L. Shadburn, Atlanta, Ga., has been named chief engineer of the Georgia State Highway Department.

Robert L. Smart, previously employed by the Pasadena, Calif., Water Department on the design and construction of a powerhouse addition, is now at the Navy Ordnance Test Station in that city.

Robert D. Henderson has resigned from the Division of Design, Tennessee Valley Authority, to accept a position with the Panama Canal and Panama Railroad in the Canal Zone. Mr. Henderson served $3^1/_2$ years in the Army.

Clinton F. Robinson, major general, Corps of Engineers, retired, is now associated with the New York City consulting firm of Frederic R. Harris, Inc., and has been elected vice-president of the organization.

Deceased

Orsino Paul Allee (Assoc. M. '16) state procurement officer for the U.S. Treasury Procurement Division at Topeka, Kans., died recently. He was 66. From 1916 to 1930 Mr. Allee was vice-president and manager of the Arkansas Bridge Co., at Kansas City, Mo., and from 1931 to 1934 president of the Technical Lubricants Co., of Kansas City. Since 1935, he had been in the Topeka office of the Procurement Division of the Treasury Department.

Edwin Francis Allbright (M. '20) civil engineer of Wollaston, Mass., died on November 12, at the age of 66. From 1929 until his death Mr. Allbright was secretary and engineer for the Grid Flat Slab Corp., of Boston. For many years he also held a similar position with the Adams-Pond Co., of Dorchester, Mass.

William Raymond Brennan (Assoc. M. '41) plant engineer for the Bethlehem Steel shipyards in Beaumont, Tex., was fatally stricken at his work on January 10. His age was 49. In his early career, Mr. Brennan had been with the Missouri, Kansas & Texas Railroad and the Missouri Pacific. Beginning in 1927, he was for a number of years with the American Petroleum Corp., which he served as party chief in charge of pipelines and topographical surveys, resident engineer, and construction engineer. Later he was with the American Republic Corp. in Houston and Beaumont, remaining at Beaumont as plant engineer when the Bethlehem Steel Co. took over the company's shipyards there.

William Clark Cattell (M. '21) retired engineer of Wenonah, N.J., died recently, at the age of 80. From 1888 until his retirement a few years ago, Mr. Cattell maintained a general consulting practice in Wenonah. During the same period, he also served as borough engineer of Wenonah and as county engineer of Gloucester County.

Robert Gustave Dyktor (Assoc. M. '48) chief engineer, Marketing Department, Creole Petroleum Corp., Caracas, Venezuela, was killed on January 23, while superintending the placement of underseas piping by tanker. Mr. Dyktor was 29 and a graduate of Washington University (St. Louis, Mo.), class of 1941. Before joining the staff of the Creole Petroleum Corp. in 1946 he had been in Venezuela as field engineer for the New York consulting firm of Parsons, Brinckerhoff, Hogan & Macdonald on the construction of Mariposa Dam and other projects. He was the author of an article on a Venezuelan dock project in the January issue of CIVIL ENGINEERING.

William Henry Cook (M. '29) engineer and architect of Youngstown, Ohio, died

(Continued on page 82)

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SERVES FOR CENTURIES

(*Continued from page 78*)

there on January 6, at the age of 62. As a practicing architect-engineer from 1922 to 1942, Mr. Cook was engaged on the construction of numerous public buildings in Youngstown. In the latter year he became field engineer for the Harrisburg, Pa., consulting firm of Gannett Fleming Corddry & Carpenter on the construction of Camp Reynolds, and in 1944 represented the same firm as project manager on construction of the Greater Pittsburgh Airport. In 1945 he resumed his own practice.

Arthur J. Boase

Arthur J. Boase (M. '27) for the past 16 years manager of the Structural and Railways Bureau of the Portland Cement Association, Chicago, died suddenly in his office on February 9. Mr. Boase joined the organization in 1930 as regional structural engineer in the Philadelphia district. Prior to that he had been professor of civil engineering at Pennsylvania Military College and at the University of Pennsylvania, and in his early career he was engaged on the design of dams and tunnels and reinforced concrete bridges in the Rocky Mountain area. An internationally known authority in the field of reinforced concrete design, Mr. Boase had written extensively on European and South American practice, and was author-chairman of the ACI *Reinforced Concrete Design Handbook*. He had been chairman of the ASCE Committe on Masonry and Reinforced Concrete and, at the time of his death, was serving on the executive committee of the Structural Division.

Francis Price Gilbert (M. '27) hydraulic engineer for the U. S. Engineer Office at Providence, died on January 17, at the age of 57. Mr. Gilbert's experience included positions as principal assistant engineer for the North Jersey District Water Supply Commission; regional hydraulic and sanitary engineer for the Resettlement Administration; regional hydraulic engineer for the Soil Conservation Service; and senior designing engineer for G. A. Fuller-Merritt, Chapman & Scott Corp. on the construction of wartime Naval bases. From 1943 to 1946 he was in charge of the hydrology section of the Providence District of the Corps of Engineers, and since 1946 had been chief of the hydrology section of the New England Division.

Leon Morley Gray (M. '26) land requisition manager of the Everglades National Park, Miami, Fla., died in a hospital there on January 11. He was 63. Before going to Miami two years ago, Mr. Gray hasd been for some years regional engineer for the National Park Service at Richmond, Va. A veteran of World War I, in which he had the rank of major, Mr. Gray was the youngest officer on General Pershing's staff.

George Rogers Heckle (M. '11) New York City construction engineer and consultant, died in a hospital in Yonkers, N.Y., on January 17. He was 71. In 1909 Mr. Heckle became associated with the Stone & Webster Engineering Corp., for which he laid out electric railway lines in Florida. Later, as vice-president of the Ambursen Hydraulic Construction Co. of Canada, he directed construction of several power projects in Canada, and during the first World War he built concrete shipways for the government at Hog Island. In consulting practice in New York since the end of the war, he had carried out hydroelectric assignments for the Frederick Loomis Co. in Canada and built a nickel-refining plant in Cuba for Ford, Bacon & Davis, of New York, in the recent war.

Leonhard John Hohl (M. '04) retired engineer of Berkeley, Calif., died at his home there on February 1, at the age of 85. Born and educated in Switzerland, Mr. Hohl worked there and in Vienna before coming to the United States in 1882. For the next 20 years he was with the Monongahela Division of the Pennsylvania Railroad and the Pittsburgh consulting firm of Wilkins & Davison. He then went to California as manager of the Cherokee Mining Co., later establishing a consulting practice in Berkeley, which he maintained for many years.

John Alan Hamer (Assoc. M. '48) hydraulic engineer in the Office of the Chief of Engineers, died in a hospital at Cheverly, Md., on January 21, as a result of burns received while rescuing his two sons from a fire in his home at Landover Hills, Md. A graduate of Trinity College, Hartford, Conn., in 1935, Mr. Hamer worked on Barkhamsted Dam for the Metropolitan District Commission of Hartford, before joining the Corps of Engineers at Providence, R. I., in July 1936. During the war, he was engaged in Naval research at Stevens Institute, Hoboken, N.J. He entered the office of the Chief of Engineers in October 1945, as a senior engineer with the hydrology and hydraulics branch, engineering division, Civil Works.

John Stewart Hallum (Assoc. M. '46) structural designer for the South Dakota State Highway Commission, Pierre, S. Dak., died on December 8 at Brady, Tex., where had gone for his health. Mr. Hallum was 39 and a graduate of Rice Institute. He had worked for the Texas and Tennessee highway departments before joining the South Dakota State Highway Commission.

Thomas Douglas Mylrea (M. '24) professor of civil engineering at the University of Delaware died in a Pittsburgh, Pa., hospital on January 19. His age was 63. A native of England, Professor Mylrea was educated at the University of Illinois, teaching there later and at the Carnegie Institute of Technology. Going to the University of Delaware in 1934, he served as chairman of the civil engineering department until recently when poor health forced him to resign from that post. Professor Mylrea held the President's Certificate of Merit for his work in rocket research.

George Perrine (M. '09) civil engineer and pioneer in tunnel and subway construction in the New York metropolitan area, died in a New York hospital on January 18. Major Perrine was assistant to the chief of the Rapid Transit Railroad Commission on the construction of early New York subways. Later, in association with the New York firm of Rodgers & Haggerty, he worked on the construction of the Pennsylvania Railroad's tunnel under the Hudson from Manhattan to New Jersey, the Holland Tunnel approaches, planning and construction of the Queens-Midtown Tunnel, and more recent New York subway expansions. He served in the Spanish-American War and the first World War and had been active in the New York National Guard.

Walter Nicholas Schroeder (M. '33) civil engineer for the Illinois State High-

(*Continued on page 84*)

Spring Meeting of ASCE
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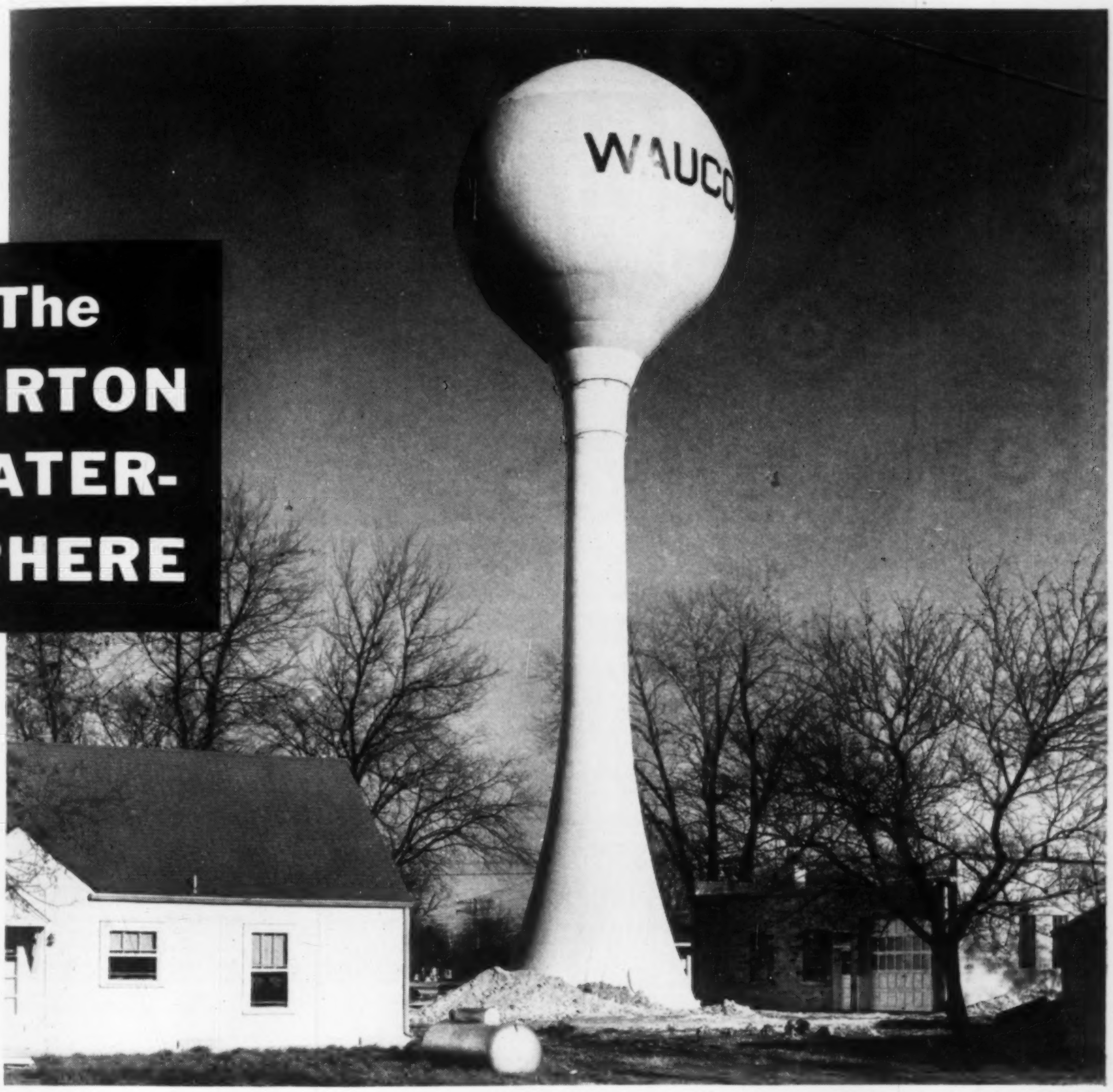
Other..

Dates of occupancy..

The HORTON WATER-SPHERE



... an entirely new design of a famous **HORTON** tank

For those elevated tank installations where graceful appearance and a modern design are important considerations—here's the new Horton Watersphere. This welded steel tank will blend in with the most progressively designed industrial plant as well as fit into any location in a municipal water system. Now—in the new Watersphere—we've even improved on striking design. Its clean lines are now unbroken slopes—both the sphere and the base are faired smoothly into the lines of the central column. There are other structural changes, too, which make all the parts of this simple structure accessible for maintenance. The ladder has been moved inside the column, and runs to the top of the sphere through an access tube. This arrangement makes it an easier job to climb the tank for inspection or painting.

Waterspheres are built in a range of seven standard sizes ranging from 25,000 to 100,000 gallons, in heights of 50, 75, 100 and 125 ft. to bottom. Other capacities and heights are available in special designs if desired. Our nearest office will give you full details and estimating figures on these capacities, or on special sizes as requested.

Above: A new 100,000-gal. Horton Watersphere, 75 ft. to bottom, erected to provide gravity water pressure for better customer service, in the water system of Wauconda, Illinois. The village is located in a resort district and its population ranges from 1600 in winter to a maximum of 2500 in the summer season.

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Chicago 4	2199 McCormick Bldg.	Los Angeles 14	1556 General Petroleum Bldg.	Seattle	1309 Stuart Bldg.
Cleveland 15	2263 Guildhall Bldg.	New York 6	3395-165 Broadway Bldg.	Tulsa 3	1647 Hunt Bldg.

Plants in BIRMINGHAM, CHICAGO, SALT LAKE CITY and GREENVILLE, PENNA.

(*Continued from page 82*)

way Department, Springfield, Ill., died in a hospital in that city on January 22. Mr. Schroeder, who was 67, had been in the Bureau of Bridges of the Illinois Department of Highways for the past 17 years. Prior to that, he had been successively, county surveyor for Harding County, South Dakota, and in private practice in Rock Island, Ill.

Henry Daniels Stowe (Assoc. M. '16) of Philadelphia, Pa., died there on February 1. Mr. Stowe, who was 69, was with the Pennsylvania Railroad from 1902 until his retirement a few years ago. During this long period he was in charge of numerous bridge construction and track-building projects for the line. He had also served as supervisor for various divisions of the railroad, and of more recent years had been assistant division engineer at Philadelphia.

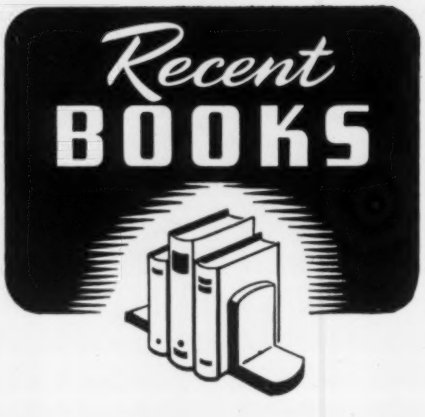
John Randolph Thrasher, Jr., (M. '44) resident engineer for the recently completed Ladd Memorial Stadium, Mobile, Ala., died in that city on December 27. He was 47. Mr. Thrasher had been in the Tennessee Highway Department, and later was a civil engineer in the Army Corps of Engineers, serving in recent years as assistant to the chief of the operations division of the Mobile District office.

William Edward Vest (M. '27) for 36 years superintendent of the Charlotte, N.C., Water Department, died at his home there on December 30. His age was 82. At the outset of his career, Mr. Vest joined the engineering staff of the Southern Railway, where he remained for 21 years. Appointed superintendent of the Charlotte Water Department in 1910, he was in active charge until 1946, when he became consultant for the department's water-expansion program. Prominent in the American Water Works Association, Mr. Vest served as director in 1930 and 1931 and was made an honorary member in 1942.

Will Paul Watson (Assoc. M. '41) president of the Hamilton Gravel Co., Hamilton, Ohio, and a veteran of both World Wars, died at his home in Hamilton on December 20. His age was 59. Mr. Watson had been connected with the Hamilton Gravel Co., since 1921, except for a period of service in the recent war as lieutenant colonel in the Army Military Police. In World War I he was overseas with the AEF, serving as member and president of the General Court Martial Board, Paris District, and with the Provisional Air Corps Regiment. Mr. Watson's early engineering work was with the Morgan Engineering Co., of Dayton, Ohio, and with F. G. Mueller, Hamilton architect.

James R. Wood, (M. '47) city engineer of Calgary, Alta, Canada, died at Carstairs on December 31, at the age of 60. Before joining the Calgary City Engineer's Department over 20 years ago, Mr. Wood was with the Imperial Oil Co., and on the Vancouver, B.C., engineering staff. As city engineer since 1940, he had supervised construction of major extensions to the Calgary sewerage system.

Recent BOOKS



APPLIED MATHEMATICS FOR ENGINEERS AND SCIENTISTS. By S. A. Schelkunoff. D. Van Nostrand Co., New York, Toronto, London, 1948. 472 pp., diagrs., charts, tables, $9^1/_4 \times 6$ in., cloth, $6.50. This book is devoted to the branches of mathematics that are needed in mathematical physics and engineering. It is divided into two parts, one considering general mathematical methods, and the other, special transcendental functions. Such topics are included as power series, vector analysis, differential equations, linear analysis, Bessel functions, and Legendre functions.

A.S.T.M. STANDARDS ON BITUMINOUS MATERIALS FOR HIGHWAY CONSTRUCTION, WATERPROOFING AND ROOFING. Specifications, Methods of Testing, Definitions. American Society for Testing Materials, 1916 Race St., Philadelphia, Pa., 1948. 306 pp., illus., diagrs., tables, 9×6 in., paper, $3. Over 80 standard and tentative specifications, test methods, recommended practices, and lists of standard definitions have been brought together in this new compilation. Those familiar with previous A.S.T.M. compilations in other fields can best judge the value of this work to both producers and consumers of the materials dealt with.

BIBLIOGRAPHY ON WATER AND SEWAGE ANALYSIS. (Special Report No. 28.) By B. H. Weil, P. E. Murray, G. W. Reid, and R. S. Ingols. Georgia Institute of Technology, State Engineering Experiment Station, Atlanta, Ga., 1948. 215 pp., $9 \times 5^1/_2$ in., fabrikoid, $4 ($4.50 foreign). This broadly classified guide to the pertinent literature on water and sewage analysis lists some 2,600 items published prior to January 1948. References have been sorted, according to subject, under "tests" for various materials and properties. In addition, access to references may be made by "methods of analysis" and an author index.

BUILDERS' MATERIALS, 2 ed. By B. H. Knight and R. G. Knight. Longmans, Green & Co., New York; Edward Arnold & Co., London, 1948. 304 pp., diagrs., tables, $8^1/_2 \times 5^1/_2$ in., cloth, $5.25. Of interest to architects, surveyors, and builders, this British book explains the physical nature, method of manufacture, uses and defects of building materials in common use. Wherever possible, simple explanations of test methods are given. This edition includes references to the more important British Standard Specifications published between 1938 and 1946, and the more important results of relevant research work published during that period.

CIVIL ENGINEERING. By V. C. Whiting and K. Mills. Longmans, Green & Co., New York, London, Toronto, 1948. 152 pp., diagrs., charts, tables, $8^3/_4 \times 5^1/_2$ in., cloth, $2.75. This book is designed to give the man who already has the practical experience, the necessary technical knowledge for a supervisory position in civil engineering works. It will give him an understanding of plans, detail drawings, quantities, and specifications, and will teach him to keep records. Materials and plant are dealt with, and a special chapter is devoted to concrete.

DESIGN FOR WELDING. Edited by Robert S Green, acting chairman, Department of Welding Engineering, Ohio State University, with the assistance of Douglas C. Williams, assistant professor of industrial engineering, and Charles B. Smith, assistant professor of civil engineering; published by the James F. Lincoln Arc Welding Foundation, Cleveland 1, Ohio, 1948. 1024 pp., illus., diagrs., charts, tables, $8^3/_4 \times 5^3/_4$ in., cloth, $2 in the United States and $2.50 elsewhere. The volume contains a collection of designs that have either been produced or at least substantiated by accounts of similar work already constructed. Sections pertaining to the following fields are included: aircraft, automotive, railroad, watercraft, containers, furniture, structures, machinery, and welderies.

ENGINEERING THERMODYNAMICS. By J. S. Doolittle and A. H. Zerban. International Textbook Co., Scranton, Pa., 1948. 429 pp., illus., diagrs., charts, tables, $9^1/_4 \times 6$ in., cloth, $5. Intended as a text for a year's course in thermodynamics, this book stresses fundamentals of the science, with brief applications to the art of heat-power engineering. The basis of this work is to present as few equations as possible and then to show how problems may be analyzed and solved by the application of a few fundamental principles. Care is exercised to present but one idea at a time in logical sequence. A brief chapter on gas turbines is included along with the commoner types of heat engines.

FLUID DYNAMICS. By V. L. Streeter. McGraw-Hill Book Co., New York, Toronto, London 1948. 263 pp., diagrs., charts, tables, $9^1/_4 \times 6$ in., cloth, $5. Designed for use in the second course in fluid mechanics for graduate students, this text is concerned with the development of the general fluid equations and their reduction to specific problems. It covers the ideal fluid theory for both two- and three-dimensional flow, as well as the theory of viscous flow. Assuming a knowledge of calculus, advanced mathematics is introduced and developed as it is needed. Emphasis is placed on the solution of problems that aid the student in his understanding of the theoretical material.

GENERAL CARTOGRAPHY, 2 ed. By E. Raisz. McGraw-Hill Book Co., New York, Toronto, London, 1948. 354 pp., illus., diagrs., charts, maps, tables, 10 × 7 in., cloth, $6. This college text has been revised to incorporate the changes that have taken place in cartography as a result of the war. In this second edition, the section on the history of cartography has been shortened, and map projections are discussed in more detail. The chapter on topographic and military maps has been enlarged. There are new chapters on aerial photography and mapping, photo-map interpretation, and photographic surveying methods.

INTERNATIONAL ASSOCIATION FOR BRIDGE AND STRUCTURAL ENGINEERING, Third Congress, Liège, 13–18 September 1948. Preliminary Publication, published by Eidgenössische Technische Hochschule, Zurich; École Polytechnique Fédérale, Zurich; Swiss Federal Institute of Technology, Zurich, 1948. 697 pp., illus., diagrs., charts, tables, $9^3/_4 \times 7$ in., cloth. This volume contains papers printed in advance of the September 1948 meeting of the association. The five general topics considered are: (1) assembling devices, structural details in steel structures; (2) developments in building structures in concrete and masonry; (3) developments in long-span steel bridges; (4) slabs and various curved structures in reinforced concrete; and (5) analysis of safety and effect of dynamic forces. Papers are in French, German, or English, with summaries in all three languages.

INTRODUCTION TO COMPLEX VARIABLES AND APPLICATIONS. By R. V. Churchill. McGraw-Hill Book Co., New York, Toronto, London, 1948. 216 pp., diagrs., tables, $9^1/_4 \times 6$ in., cloth, $3.50. An introduction to the theory of complex variables is combined with an adequate treatment of applications for the use of students preparing to enter the fields of physics, theoretical engineering, and mathematics. The part of the theory most needed in these fields is carefully treated and is accompanied by examples and exercises. The applications to problems in physics and engineering are kept at a fairly elementary level.

MATHEMATICS AT WORK. By H. L. Horton Industrial Press, New York 13, 1949. No pagination, diagrs., tables, $9^1/_4 \times 6$ in., fabrikoid, $6 This book is a working manual for machine designers, tool engineers, gage designers, mechanical draftsmen, and technical or trade students. It reviews the fundamentals of arithmetic, algebra, geometry and trigonometry. There are a comprehensive discussion of problems and their solution and an explanation of special aids in computation, in addition to 145 pages of standard mathematical tables, including logarithmic and trigonometric tables.

MECHANICAL VIBRATIONS. By W. T. Thomson. Prentice-Hall, New York, 1948. 222 pp., diagrs., charts, tables, $8^1/_2 \times 5^1/_2$ in., cloth, $5. Based on courses given at the University of Wisconsin, this book presents the fundamentals of vibration theory and provides a general background for advanced study in the field. The student is assumed to have an elementary knowledge of calculus, dynamics, and strength of materials. No familiarity with differential equations is presupposed. Numerous problems are presented throughout to illustrate the method of analysis.

PRACTICAL ANALYSIS, GRAPHICAL AND NUMERICAL METHODS. By Fr. A. Willers, translated by R. T. Beyer. Dover Publications, New York, 1948. 422 pp., diagrs., charts, tables, $9^1/_2 \times 6$ in., cloth, $6. This comprehensive work presents the numerical and graphical and many of the instru-

(*Continued on page 87*)

"But what ails Henry, Doctor?"

MAJOR credit for the virtual wiping-out of the typhoid fever scourge of 50 years ago is due to the growth and progress of public water works systems. In 1899, when our Company was established, there were about 3,000 public water works systems in America. Today, 12,000 water works furnish 85 million people with eight billion gallons of water per day, 90 per cent of which requires and receives treatment to make it safe.

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Construction Superintendent or Field Engineer; Assoc. M. ASCE; 50; married; no dependents; licensed engineer; speaks Spanish, 28 years' experience on surveys, buildings, timber and steel wharves, industrial plants, railroads, earthwork, airport construction, asphalt and base stabilization in southern U.S. and South America. Prefers foreign employment. Available on 30 days' notice. C-470.

Civil Engineer; Jun. ASCE; 22; civil engineering graduate; single; one years' experience as structural designer. Desires employment with good future as field engineer with firm engaged in industrial or commercial construction. Willing to travel; will locate anywhere in U.S. C-471.

Civil Engineer; Assoc. M. ASCE; 28; married, honor graduate; registered; 7 years' progressive field and office experience in general and industrial construction and maintenance, civil and military. Available on 60 days' notice for responsible permanent connection with contractor, consulting engineer or industrial organization. Prefers Eastern, Southern or Southwestern location, but will consider others. C-472.

This placement service is available to members of the Four Founder Societies. If placed as a result of these listings, the applicant agrees to pay a fee at rates listed by the service. These rates—established to maintain an efficient nonprofit personnel service—are available upon request. The same rule for payment of fees applies to registrants who advertise in these columns. All replies should be addressed to the key numbers indicated and mailed to the New York Office. Please enclose six cents in postage to cover cost of mailing and return of application. A weekly bulletin of engineering positions open is available to members of the cooperating societies at a subscription rate of $3.50 per quarter or $12 per annum, payable in advance.

Positions Available

Engineers, (*a*) Structural Engineers, graduates or licensed, experienced primarily in the design of grade-separation structures, highway and railway bridges. (*b*) Civil Engineers, young, graduates, capable of some designing, but capable principally, of detailing both structural steel and reinforced concrete structures incident to the construction of grade separations and railway and highway bridges. (*c*) Structural Draftsmen for detail drafting only, with experience in this line. Write stating qualifications. Location, South. Y-1893.

Bridge Engineer, experienced in design of steel highway bridges. Must be qualified to design and detail plate girder and truss spans and floor systems. Two or three years' work. Salary, $9,000 a year. Location, Alaska. Y-2002.

Structural Engineer. Must be capable of completely designing small steel structures. Prefer civil engineering graduate, experienced in both design and fabrication. Excellent opportunity with well-established firm in Missouri. Y-2015-R5438.

Instructor and Assistant Professor, civil graduate, preferably with advanced degrees, 30-40. (*a*) One to teach structures, (*b*) One to teach sanitation courses. Salaries open. Location, New York, N.Y. Y-2037.

Engineers. (*a*) Chief Engineer with experience in steel and concrete bridge design and analysis of indeterminate structures, to take charge of design and staff of 20 designers and draftsmen. Salary, $6,000–$6,500 a year. (*b*) Structural Draftsman with steel and concrete experience, to lay out and detail highway bridges. Salary, $4,000 a year. Location, South. Y-2044.

Civil Engineer, graduate, with at least 5 years' general irrigation design experience, including watershed hydrology studies, to make survey and plan irrigation project. Salary, $6,000 up, plus expenses. Location, Venezuela. Y-2077.

Construction Engineers, field and administrative, for steam powerhouse construction. Write stating education, experience, marital status and salary desired. Salaries open. Location, western Pennsylvania. Y-2102.

Project Engineer, 30–35, civil graduate, with general building construction and subcontracting experience, to assist project manager. Must have at least 5 years' multi-story building experience covering field engineering, estimating, scheduling, checking, costs, etc. Salary, $5,000–$6,000 a year. Location, New York, N.Y. Y-2103.

City Engineer and Director of Public Work with at least 5 years' municipal engineering experience, to take charge of streets and sidewalks; sewers and treatment plant; street lighting and refuse disposal. Salary, $6,500 a year Location, Connecticut. Y-2104.

Engineers. (*a*) Estimator, preferably civil graduate, with design and estimating experience, to take off and price structural steel for buildings, bridges, etc. (*b*) Design Draftsmen, preferably civil graduate, with experience, to design and detail structural steel for buildings, bridges, etc., for fabricator. Salaries open. Location, New York, N.Y. Y-2124.

Surveyor with at least 4 to 5 years' experience in precise location work for mine property in Venezuela. Experience in coast and geodetic service desirable. Salary, $7,200 a year plus expenses. Y-2130.

Engineers with experience. (*a*) Structural Steel Detailer. (*b*) Checker on structural steel details. (*c*) Estimator of structural steel. (*d*) Estimator of reinforcing steel. Salaries open. Location, California. S-304.

Structural Engineer with minimum of 5 years' experience in the design of large steel and concrete structures, such as steam power plants and industrial buildings. Location, Pennsylvania. Y-1712(*a*).

(*Continued on page 87*)

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Apply, stating professional qualifications and experience to Box C. E. 165, CIVIL ENGINEERING, 33 West 39th Street, New York, N. Y.

(Continued from page 86)

ASSOCIATE ENGINEERS, 30–40, graduate, preferably registered professional engineer, with from 8 to 15 years' experience for a consulting engineer, whose work covers surveys, reports, designs, construction and operation of water supplies, sewage systems, power plants, highways, etc. Should be able to take responsible charge of work both in the office and in the field. Will meet clients and carry on negotiations with them. Salary, open. Location, Pittsburgh, Pa. Y-1761.

ENGINEERS. (a) Assistant Construction Superintendent, with at least 10 years' contracting experience covering industrial plant utilities, roads, etc. Salary, $10,200–$11,400 a year. (b) Personnel Manager with at least 5 years' experience in labor relations work in construction or allied industry. Salary, $7,800–$9,000 a year. Location, England. Y-1774.

PROFESSOR OR INSTRUCTOR, not over 45, architectural graduate, to teach courses in methods and materials of architectural construction, architectural working drawings, mechanical equipment of buildings and graphic statics. Preferably native born American citizen. Salary, and rank dependent upon qualifications. Location, Pennsylvania. Y-1804.

TEACHING PERSONNEL. (a) Associate Professor, civil or mechanical, to serve as head of newly created department of mechanics, with opportunity of promotion to full professorship. Salary, $4,500–$5,000 a year. (b) Instructor or Assistant Professor in civil engineering, sanitation or water works, to teach general civil engineering course. Should have at least a master's degree. Salary, $3,000–$3,600 a year. Location, Upstate New York. Y-1805.

Recent Books

(Continued from page 84)

mental methods of analysis which provide solutions useful to the practical scientist. The first chapter deals with the special problems encountered in calculating with approximate numbers. Succeeding chapters cover standard methods of interpolation, methods of numerical differentiation, practical determination of the roots of single algebraic equations and systems of linear equations, empirical formulas, and the graphical and numerical integration of differential equations.

ROAD AGGREGATES, THEIR USES AND TESTING. (Roadmakers' Library, Vol. 3.) By B. H. Knight and R. G. Knight. 2 ed. Longmans, Green & Co., New York; Edward Arnold & Co., London, England, 1948. 259 pp., illus., diagrs., charts, tables, $9\frac{1}{4} \times 5\frac{3}{4}$ in., cloth, $6.50. The results obtained in a scientific study of road-stones, for use in solving practical problems encountered by the road engineer are presented in this volume, which gives guidance in the choice and testing of materials. By describing, illustrating, and explaining many failures that have occurred in practice, it indicates the defects to be guarded against.

SOCIETY FOR EXPERIMENTAL STRESS ANALYSIS, Proceedings, Vol. 6, No. 1. Addison-Wesley Press, Kendall Square, Cambridge, Mass., 1948. 137 pp., illus., diagrs., charts, tables, $11 \times 8\frac{1}{2}$ in., cloth, $6. Presenting 15 papers on various phases of stress analysis, this volume also contains the membership list of the Society and a cumulative index of the first five volumes of its proceedings. The papers are on such subjects as stress and strain states occurring in bending rectangular bars, direct coupled amplifier for recording, dynamic strain, and photoelastic laboratory equipment and methods.

SUPERSONIC FLOW AND SHOCK WAVES. By R. Courant and K. O. Friedrichs. Interscience Publishers, Inc., New York, 1948. 464 pp., diagrs., tables, $9\frac{1}{4} \times 6$ in., linen, $8. Helpful to engineers, physicists, and mathematicians, this book treats basic aspects of the dynamics of compressible fluids in mathematical form. It presents a systematic theory of nonlinear wave propagation, particularly in relation to gas dynamics. Classical as well as recent developments are included. No attempt has been made to cover the entire field or to provide summaries of results that could be used as recipes for attacking specific engineering problems.

WELDING FUNDAMENTALS. By H. P. Rigsby. Pitman Publishing Corp., New York and London, 1948. 178 pp., illus., diagrs., charts, tables, $9\frac{1}{4} \times 6$ in., cloth, $2.75. In this compilation of the fundamentals and principles of welding for the engineering student, the actual technique of welding is treated as secondary material. Following a historical development of the various welding methods are chapters on the equipment needed for each method. Welding gases, rods, fluxes, and types of joints are considered as well as the testing of welds. Standard welding symbols and a glossary of welding terms are included.

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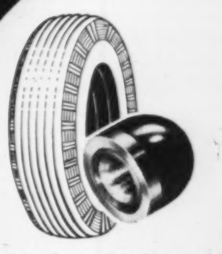

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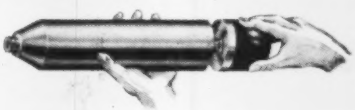

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◆

Highlift Boom

A HIGHLIFT BOOM is now available for both the singlemix 34-E (single drum) and duomix 34-E (double drum) Multi-Foote concrete pavers. This boom can be controlled from the operator's platform and held in any position above the ground with a vertical lift of 23 ft bucket clearance. This allows the paver to be used in a wide variety of work such as parapets, bridge abutments, retaining walls and footings and walls for general building construction. The highlift boom will work flat and in many cases, permits working under steel structures where equipment with longer booms would find difficulty. **The Foote Co., Inc., 1931 State St., Nunda, N.Y.**

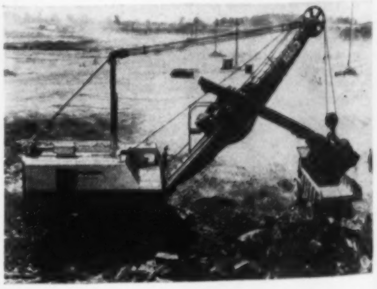
Hydraulic Clutch-Type Power Pump

A COMPACT, lightweight, hydraulic clutch-type power pump, known as the Hydra-Clutch pump has been designed and put on the market. This pump is especially designed for those applications where hydraulic power is desired for periodic short lengths of time. One simple control engages the clutch, disengages the clutch, and operates the slide valve. It provides the machinery equipment manufacturer with a quick, easy low cost installation which assure his customers of long, trouble free service. Road and farm machinery can be quickly converted from manual to hydraulic control with the pump. The pump is also adaptable to industrial, plant and railway maintenance, and service repair. It can easily and quickly be put to efficient use on such equipment as hydraulic clamping vises; arbor presses; forming, straightening, and bending devices; light material handling units; small balers and pressure inserting equipment. **Dept. 1220, Waukesha Hydraulic Corp., Waukesha, Wis.**

◆

Electric Shovel

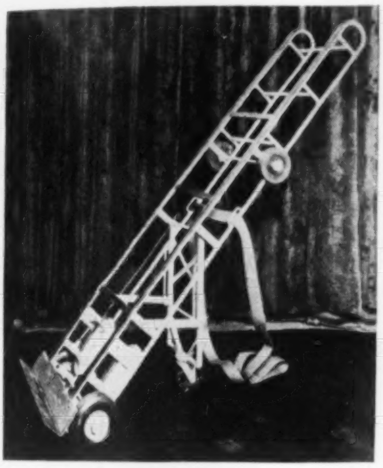
THE MARION TYPE 111-M Ward-Leonard all-electric machine has been added to the company's line of excavating equipment. The shovel is designed for heavy-duty service in the coal, quarry, metal mining, and construction industries. As a standard shovel, the machine is equipped with a $3^1/_2$-cu yd dipper and 33-ft boom, while for coal loading service, the dipper capacity is 6 cu yd. Control of the various motor speeds and direction of rotation is obtained by the use of the Ward-Leonard system of generator voltage control. Newly designed, shunt wound, 230-volt, direct current mill type motors have exceptionally low armature inertia, high overload capacity, and are designed especially for extreme reversing service. **Marion Power Shovel Co., Marion, Ohio.**



Marion 111-M

Caterpillar Treaded Hand Trucks

A NEW HAND TRUCK has been designed for the handling of crates and other heavy equipment, especially where there is a problem of moving them over curbings or up a flight of stairs. The Stevens escort truck has a caterpillar tread which literally "crawls" up a stairway. The tread rolls easily over steel bearings set in an aluminum frame. The load is distributed evenly from step to step and allows for ease in handling, up or down, without the danger of chipped or marred stairways. The retractible swivel wheel on the model supports the entire load when rolling on a level floor. The steel model of this type has a capacity of 1500 pounds. Two wheels near the top of the frame are used when loading heavy equipment into a truck. The wheels are placed on the bed of the truck, the ground end may then be raised and the whole load rolls right in without the necessity of lifting it. **Associated Services, 224 W. Main St., Carlinville, Ill.**



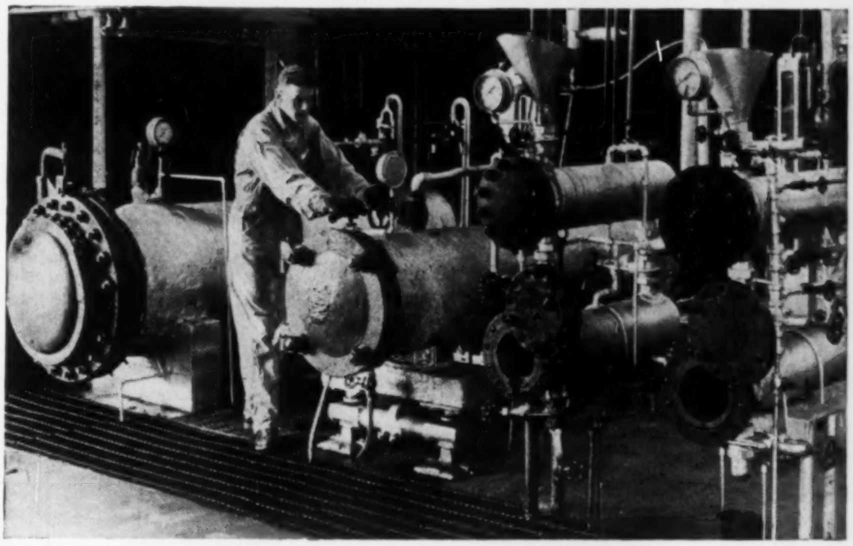
Escort Truck

◆

Hardfacing Alloys

A COMPLETE NEW LINE of hardfacing alloys is announced by Air Reduction Sales Company. Divided into three primary groups, ferrous alloys, cobalt base alloys, and tungsten carbide, there are a total of fifteen hardfacing alloys available. According to the manufacturer, this is the largest, most complete line of hardfacing alloys on the market today. Especially developed to combat abrasion, impact, heat, and corrosion, the alloys will increase the work-life of your equipment from two to twenty-five times. In order to stimulate the introduction of this latest member of the Airco welding family, the manufacturer is making a special offer of a trial assortment of alloys. This trial assortment is being made available at the special price of $2.95. **Air Reduction Sales Co., 60 E. 42 St., New York, 17, N.Y.**

These experimental wood-treating cylinders vary in size from 2" x 12" to 4' x 20'. It is possible to make detailed studies ranging from test-tube quantities to semi-commercial quantities.



HOW KOPPERS FAMOUS TECHNICAL LABORATORY

helps improve serviceability of wood

The Koppers Technical Laboratory at Orrville, Ohio is one of the most complete wood-treating laboratories in the world. Here, Koppers experts, working with the best in modern equipment, lead the field in the development of improved wood-preservatives and techniques.

In addition to other research, the staff of this laboratory is constantly working on the following projects: a continuing study of pressure-treatment with creosote; the evaluation of all known treating materials; the development of new preservatives.

▶▶ How Koppers technical facilities can help you!

This famous Koppers Technical Laboratory is now equipped to handle your specific wood-treating problems. Its technical staff welcomes your inquiries, and will gladly recommend the *proper* technique of treatment . . . the *proper* type of preservative to meet your individual needs. Write for further information.

KOPPERS PRESSURE-TREATED WOOD

KOPPERS COMPANY, INC., Pittsburgh 19, Pa.

Back Again by Popular Demand

THE FAMOUS DAVID WHITE

Western Reconnaissance Transit

HERE IT IS — back in production at your numerous requests — and with many improvements. The Western Reconnaissance Transit, while moderate in price, is a high quality instrument particularly designed to serve many engineering and surveying purposes. While capable of distant focusing, it can also be used for close work, giving versatility.

No desirable features have been overlooked in the construction of the "Western." It is a standard instrument of precision, of the same exacting construction as our Engineers' Transits, yet offering a saving well worth while.

SPECIFICATIONS — No. 7064 TRANSIT

TELESCOPE: 9¼" achromatic terrestrial. *Coated optics. Objective lens* with effective aperture 1.141" — *Internal focusing,* erecting eyepiece with improved spiral movement for stadia wires. Magnifying power 20 diameters. Stadia wires fixed ratio 1:100 reading direct from center of instrument, the constant (f+c) being negligible. Ground spirit level to telescope, graduated 5'! long; sensitiveness 60 seconds. Improved Clamp and Tangent Screw with counter spring.

VERTICAL CIRCLE: 4" diameter graduated to ½ degrees on solid silver, with double direct vernier reading to one minute, with removable aluminum guard to circle.

COMPASS: Gold plated needle about 3¾". Compass ring beveled graduated on solid silver to half degrees and numbered in quadrants. Compass box watertight, with variation ring.

HORIZONTAL LIMB: 5-5/16" diameter. Graduated on solid silver to ½ degrees, numbered 0°-360° in two ways, with double-direct vernier reading to one minute, with ivory hinged reflector — too fine spirit levels, sensitiveness about 75 seconds.

CENTERS: Bronze anti-friction alloys, extra long and accurately fitted. Shifting center. Improved clamp and tangent, clamp and leveling screws of nickel silver.

FINISH: Black morocco enamel and lacquer.

EQUIPMENT COMPLETE: With strong aluminum base plate, sun shade, plumb bob, magnifying glass, adjusting pins, screw driver, oil can and brush, packed in fine polished hardwood case. Full length split leg tripod, 3½" 8 thread standard.

WEIGHT: Instrument 10 lbs., tripod 11½ lbs. *Note: Extension leg tripod No. 9070 extra.*

DAVID WHITE COMPANY

Write for name of your nearest dealer or contact us direct.

359 W. Court St.
Milwaukee 3, Wis.

Slide Rule Watch

IDEAL FOR ENGINEERS, accountants, architects, and scientists, "Arithmo," the Juvenia calculating wrist watch, has an accurate, precision slide rule built around the dial. Since the development of the circular slide rule, which reduces bulk and provides for an endless scale, watchmakers have attempted to adapt it to a watch. The slide index on the "Arithmo," is automatically controlled. On turning the rim into which the watch crystal is set, the slide index, made of unbreakable glass, automatically rotates; its pointer is made to face noon and it remains there although the rim goes on revolving. It starts again in the opposite direction as soon as the rim is turned the other way. All figures to be read are always in their normal positions and all results are always found in the same place. Made with a fine 17 jewel Swiss movement, the watch is available in polished stainless steel or in 18 karat gold. It may be purchased at **Georg Jensen** in New York. Inquiries as to where the watch may be obtained other than at **Georg Jensen's** should be addressed to the **Juvenia Watch Agency, Inc., 604 Fifth Ave., New York, N.Y.**

Arithmo

◆

Impact Crusher

NOW IN QUANTITY production, the world's largest impact stone crusher, the model 5050 double impeller breaker, can take stone up to 50 in. and reduce it to aggregate in one operation. Weighing nearly 54 tons and standing 14 ft high, it is the largest crusher ever made to crush stone by impact in suspension. The 5050 will produce aggregate in two sizes, minus 8 in. and minus $3^1/_2$ in. Mounted on 18-in. I-beam skids, the breaker is 14 ft long and 9 ft, 6 in. wide. Twin cast steel impellers, each weighing 13,400 lb, catch stone in mid-air as it enters the breaking

(*Continued on page 92*)

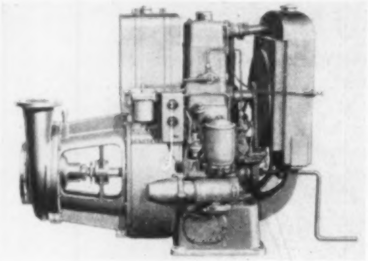
Equipment, Materials & Methods (Continued)

chamber and sends it flying against breaker bars set around the chamber. Each impeller has three pairs of 500-lb manganese or alloy steel bars, reversible to provide two wearing edges. Impellers, capable of speeds up to 785 rpm, require separate power units producing from 100 to 125 hp. Each impeller has its own V-belt drive. **New Holland Mfg. Co., Mountville, Pa.**

◆

Diesel Engine

AFTER EXTENSIVE DEVELOPMENT work and experimental pilot model production, Nordberg Manufacturing Company announces a new 10 hp diesel engine. Known as type 4FS-1, this new engine is an extra heavy duty vertical type, four-cycle, single cylinder, mechanical injection engine. It has a $4^{1}/_{2}$-in. bore and $5^{1}/_{4}$-in. stroke. This engine is available for all small stationary and portable power applications as electric generating units, pumping units, and power units for belt or chain drive or direct connection and also with a stub shaft for direct connection.



Nordberg Engine

The engine is a completely self-contained unit ready to put into service. Its ten-gallon tank provides sufficient fuel for 12 hours of operation at full load. The machine is offered for hand starting with 12 volt electric starting available as optional equipment. **Nordberg Mfg. Co., Milwaukee 7, Wis.**

◆

Pneumatic Grouter

A PNEUMATIC PRESSURE injection grouter that can mix plastic cement as well as ordinary mixtures has been designed. The grouter weighs approximately 450 lb and has a tank charge capacity of 3.5 cu ft. This machine uses $1^{1}/_{4}$ in. diameter discharge for all normal grouting operations and intrusion work and uses 2 in. diameter discharge for coarse aggregate compositions. The ability to place various kinds of cementitious or inert material compositions of plastic or fluid consistency through light flexible hose or pipe lines, by the use of these grouters, into otherwise inaccessible locations, above or below ground, provides for outstanding structural conveniences and advantages to the contractor. **The Prehy Co., 420 Lexington Ave., New York 17, N.Y.**

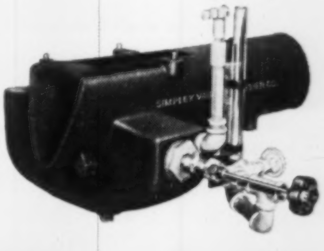
...about how to measure

LOW FLOW RATES?

There's an easy way to solve your problems! Simplex Type S-Parabolic Flume Meters measure low flows with greatest accuracy! Compact in design, the cast iron measuring section is ready for immediate installation. Designed to provide self-scouring action, there are no pockets or grooves to catch sediment or solids. It operates under extreme low head and low flow conditions, and measures over a long flow range from maximum to 5% of maximum capacity.

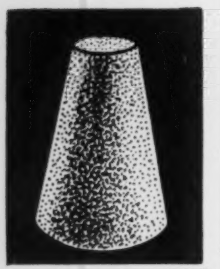
This flume is available in sizes from 6″ to 36″ diameter inclusive and may be attached easily to larger pipe sizes by an eccentric reducer. Mechanical or electrical transmission and indoor or outdoor installation are optional.

Send now for your free copy of bulletin 210—complete operation, installation, capacity data—to the Simplex Valve & Meter Company, 6724 Upland Street, Philadelphia 42, Pa.

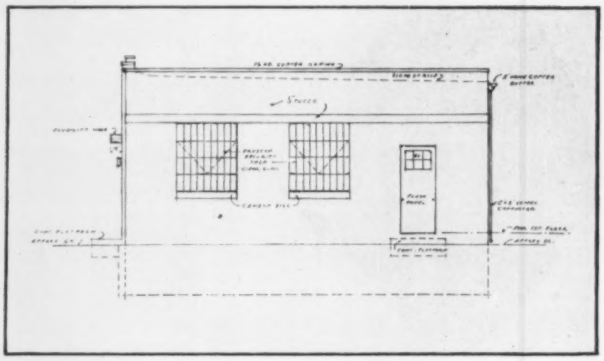


TRY **SIMPLEX**

VALVE AND METER COMPANY



with CONCRETE
— the small extra first cost of test samples pays off in assurance of efficiency and durability of the finished structure.



with TRACING CLOTH . . .

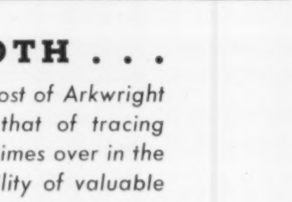
The small extra first cost of Arkwright Tracing Cloth, over that of tracing paper, repays many times over in the efficiency and durability of valuable drawings.

Arkwright gives both immediate *and* future advantages. The expert work of the draftsman is made permanent. Your investment in time and money is backed by sharp, clean reproductive quality. Under repeated use — or on file for subsequent need — Arkwright assures perfect drawing performance year after year.

For every drawing worth keeping for future use — use permanent Arkwright instead of perishable tracing paper. Send now for generous samples and prove this superiority. Sold by leading drawing material dealers everywhere. Arkwright Finishing Company, Providence, R. I.

The Big Six Reasons Why Arkwright Tracing Cloths Excel

1. Erasures re-ink without feathering.
2. Prints are always sharp and clean.
3. Tracings never discolor or go brittle.
4. No surface oils, soaps or waxes to dry out.
5. No pinholes or thick threads.
6. Mechanical processing creates permanent transparency.



ARKWRIGHT
TRACING CLOTHS
AMERICA'S STANDARD FOR OVER 25 YEARS

Eradicable Typewriter Ribbon

A NEW KIND OF typewriter ribbon makes it possible to turn out perfectly typed letters and forms of all kinds. The secret behind this amazing new ribbon called "Del-e-Tape" is that typing errors may be made to vanish completely with the use of a liquid eradicator. When a change is necessary, a word or a whole sentence can be made to disappear like magic by painting away the words with just a touch of eradicator. It takes only a second or two and leaves the paper crystal clear, without the faintest smudge or trace of the error. In addition to the saving in time and patience, Del-e-Tape ribbons through the elimination of erasures serve to keep typewriters cleaner since there is no opportunity for rubber particles to fall into the machine. **Aetna Products Co., 202 E. 44 St., New York, N.Y.**

◆

Underground Dam

SUBSURFACE SEEPAGE, one of the chief causes of loss or pollution of water, may now be controlled by constructing a permanent underground dam by means of an asphalt emulsion, it was announced recently. The subterranean barrier is built without excavating, by injecting the asphalt emulsion into the earth through a pipe. The Shellperm process represents a landmark in the control of subsurface flow. The underground barrier may prevent serious leakage of water through banks or reservoirs, check contamination caused by infiltration, and prevent sea water from seeping into fresh water wells. Aside from its role in water conservation, Shellperm can also be used to check seepage around tunnels, road beds, or other subsurface structures, without the use of such relatively expensive techniques as sheet piling. **Shell Oil Co., Inc., 50 W. 50 St., New York 20, N.Y.**

◆

Oil Slick Remover

AN ECONOMICAL and efficient medium for permanently removing oil or gasoline from the surface of harbors and waterways is being manufactured. The product, known as Carbosand, is finely divided sand which has been mixed with a high fixed carbon solution, then roasted in a kiln type furnace, and finally treated by a simple chemical and heat process and bagged. According to the manufacturers, oils and oily lighter-than-water substances, can be removed from water surfaces by using an organophilic and hydrophobic powder. When a powder of this type is deposited on oil a stable suspension is formed. Any of the powder striking the water surface floats until it comes in contact with oil. The lighter-than-water oil slick changes immediately into a heavier-than-water oil-powder suspension which sinks to the bottom permanently. Carbosand is such a powder. It is applied to the water surface with an air spray, a $3^{1}/_{2}$ hp compressor which delivers up to 15 cu ft per min at 25 to 35 lb per sq in. being a sufficient air source. **Carbosand Corp., 915 Eye St., N. W., Washington, D. C.**

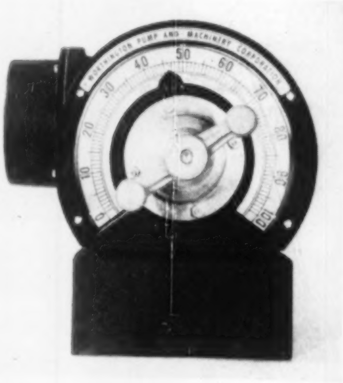
Hand Level

PRELIMINARY ENGINEERING and construction surveys of all types can now be made more swiftly and accurately with a new improved hand level recently developed. New features include the incorporation of the level vial inside the instrument to eliminate the usual inconvenient protrusion. Adjustment of the instrument is pre-set and maintained by spring tension regardless of rough handling. The prism and lens are mounted in a sturdy, one piece frame, preventing any change of adjustment due to movement of these parts. The level is delivered complete in a handsome leather case with belt loop, yet it is sturdy and light enough to carry easily in a shirt pocket. **Brunson Instrument Co., Dept. G., Kansas City 6, Mo.**

◆

Decanting Gear for Water Softeners

A DECANTING GEAR used for automatically lowering the swing-pipe decanting tube in the chemical agitating tank to feed chemical to the softener in proportion to the raw water flow has recently been announced. Its operation is paced by the raw water meter. The dial indicates the amount of chemical liquid in the tank. Connections are provided for the attachment of an electric low-level alarm. The decanting tube is positioned by a flexible cable attached to the shaped and grooved drum. Rotation of the drum pays off cable and lowers the decanting tube. When desirable to recharge the chemical tank, the decanting tube is raised to its starting position by cranking. **Water Softener Section, Worthington Pump & Machinery Corp., Harrison, N.J.**



Decanting Gear

◆

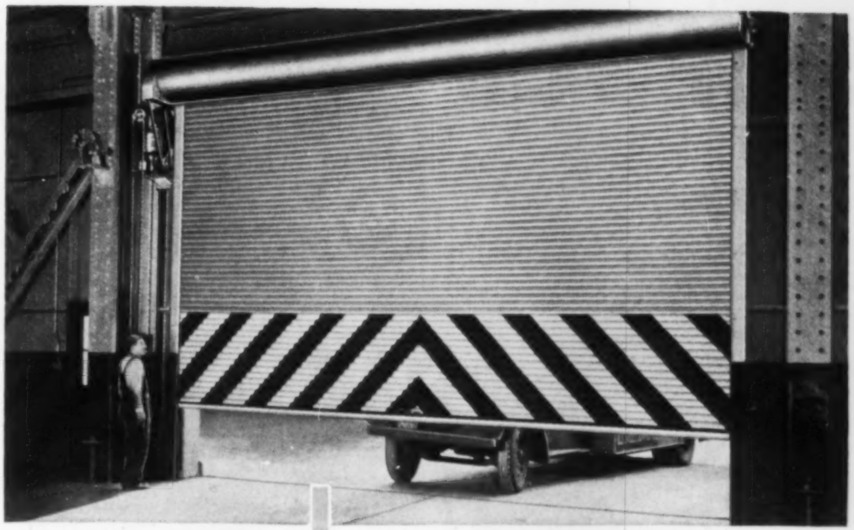
Drawing Instrument

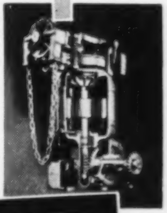
A VERSATILE DRAWING instrument, the Colmery Protractor Geometrical Rule AA combines an English scale in 16ths, a metric scale in millimeters, an engineer's scale in 10ths and 20ths, a protractor, 30- and 60- triangles, and various geometric shapes, all in one instrument. The rule hooks conveniently into standard three-ring notebooks. Actually 14 instruments in 1, the rule is especially useful for detail drawing, field sketching, quick construction of geometric figures, and diagrammatic sketches. Made of tough, noninflammable transparent plastic, injection molded for precision, the combination instrument saves considerable time and manipulation of drawing tools, a factor which is almost equally important in the field and at the drawing board. It is at present available only from the manufacturer and sells for $2.00. **Plastic Enterprise, Inc., Canton, Ohio.**

Lo-Slump Concrete Bucket

FOR EASY HANDLING of concrete of any stiffness, the C. S. Johnson Company has introduced a Lo-Slump concrete bucket in 2, 3, 4, and 8 cu yd sizes. Designed for heavy-duty requirements on big dam construction work, the bucket has been approved for use on construction jobs supervised by government agencies. Extensive tests have shown that the bucket satisfactorily discharges mass concrete with cement content as low as 2 bags per cu yd and slumps down to $^1/_2$-in. using 6-in. aggregate. The bucket deposits these mixes without segregation. The bucket

(*Continued on page 94*)





KINNEAR STEEL ROLLING DOORS

Space-Saving Convenience Plus a Bonus In Protection

It's easy to see why Kinnear Rolling Doors offer so many cost-cutting, time-saving advantages. They open straight upward and coil into a small area above the doorway. As a result, all floor, wall and ceiling space around the opening is *fully usable at all times.* No areas need to be reserved for door action. When opened, the doors clear the entire doorway. They stay completely out of the way, safe from damage by wind or vehicles.

Along with this high efficiency and convenience, you get a bonus of all-around protection and low-maintenance service. The strong but flexible *Kinnear-originated* curtain of interlocking steel slats gives extra protection against fire, wind, riot, intrusion, and accidental damage. Kinnear Rolling Doors are built to fit any openings in old or new buildings. Motor or manual control. Write for details.

MOTOR OPERATION
The rugged Kinnear Motor Operator shown at right can be added to any Kinnear Rolling Door for maximum speed, ease, and convenience of operation.

REMOTE CONTROL
In addition to push-button controls at the doorway, others may be added, at any number of convenient points, on motorized Kinnear Doors.

KINNEAR ROLLING DOORS

THE KINNEAR MANUFACTURING CO.
Factories: 1080-90 Fields Ave., Columbus 16, Ohio
1742 Yosemite Avenue, San Francisco 24, Calif.
Offices and Agents in all Principal Cities

STOP FISH

BY ELECTRONICS

This patented fish control method employs modern electronics in overcoming a serious operating and maintenance problem. Fish of all sizes are kept at a *safe distance* from intake structures, or screens, by the use of an Electronic Control Unit. This equipment, generating special electrical impulses, energizes an electrode system designed and engineered for your particular fish control problem.

The Burkey Electric Fish Screen has been thoroughly proven through years of service in Condensing Water Intakes, Hydroelectric Plants, Water Systems and Industrial Pumping Installations. DOES NOT STUN OR KILL FISH.

Recommended by State Conservation Officials

Free literature and quotations upon request

Electric Fish Screen Co.

1130 No. Poinsettia Place
Hollywood 46. California

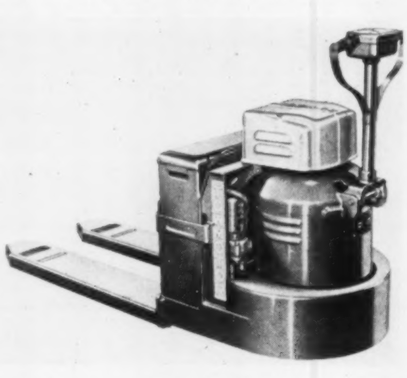
Equipment, Materials & Methods (Continued)

can be operated manually or by compressed air. Completely automatic when operated by air, bucket gates close instantly when supply hose valve is released or when hose nozzle is pulled away from bucket air socket. Although constructed of $^3/_8$- and $^1/_4$-in. plate, the bucket has less dead weight than other heavy-duty concrete buckets. The 6 ft diameter 4-yd size weighs only 4,000 lb. **C. S. Johnson Co., Champaign, Ill.**

◆

Hand Pallet Truck

A BATTERY POWERED hand pallet truck that offers many new and unusual features has just been announced by Towmotor Corporation. It is a powerful, compact, fully tested pallet type unit. The unit is easily maneuvered in close quarters and has a high safety factor even under maximum loads. Major features include rapid lifting of loads, high traction, maximum power, safety handle with control buttons for either right or left hand operation, 3-point suspension for smooth travel over uneven surfaces and differential-action trailer wheels that eliminate wheel scuffing and insure easy turning, thus saving excessive wear on both trucks and floor. **Towmotor Corp., Cleveland 10, Ohio.**



Pallet Truck

◆

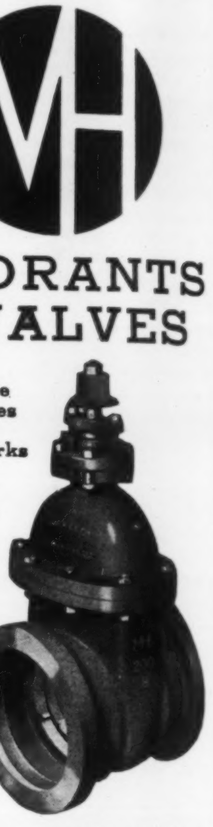
Rubber Traffic Cone

AFTER STUDYING THE hazards of present day traffic controls, the rubber Trafficone has been introduced. These cones have the powerful appearance of steel yet are made of safe, collapsible rubber. Many of the heaviest traffic centers in the country have submitted these cones to very severe tests and they have proved most effective. One of the most outstanding features of this cone is its durable, flexible construction which means infrequent replacement because of breakage, distortion or wear. The lightweight construction of these rubber cones makes them easy for a man to handle and it has been found that traffic barriers can be set up in $^1/_{10}$ the time. **Enterprise Development Corp., Burbank, Calif.**

MH

HYDRANTS & VALVES

Pipe Line Accessories for Water Works and Sewage Works



Write for Catalog No. 34

VALVES: A.W.W.A. type iron body, bronze mounted with double-disc parallel seat or solid wedge type. Non-rising stem, outside screw and yoke, or with sliding stem and lever. Also furnished hydraulically operated. Square bottom type operates in any position.

HYDRANTS: Standard A.W.W.A. type approved by Underwriters and Factory Mutuals.

M & H PRODUCTS INCLUDE

- FIRE HYDRANTS
- GATE VALVES
- TAPPING VALVES
- WALL CASTINGS
- SPECIAL CASTINGS
- TAPPING SLEEVES
- CHECK VALVES
- FLOOR STANDS
- EXTENSION STEMS
- SHEAR GATES
- MUD VALVES
- VALVE BOXES
- FLAP VALVES
- SLUDGE SHOES
- FLANGE AND FLARE FITTINGS
- FLANGED FITTINGS
- B & S FITTINGS
- CUTTING-IN TEES

M&H VALVE AND FITTINGS COMPANY

ANNISTON, ALABAMA

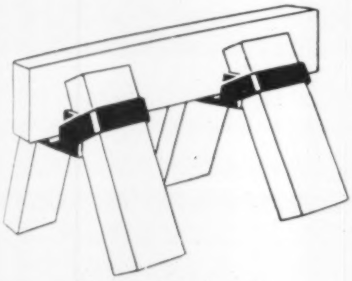
Wood Preservative

A most useful wood preservative has been developed in Santophen 20, Monsanto's pentachlorophenol, a combination of coal's derivatives with chlorine. This oil-soluble wood preservative is toxic to wood-rotting fungi, termites and wood-boring insects, grass roots, and other deleterious vegetation. It is not appreciably soluble in water—does not leach readily and is a "clean" oil treatment. It is a chemical compound with fixed identity, chemically reproducible year after year without variation. Santophen 20 can be determined analytically, which makes possible accurate control of solution strength and enables the determination of its distribution in wood. Tests on home and farm buildings, industrial buildings, railroads and highways, utilities as poles and crossarms and mines have proven the chemical to be most satisfactory. Further information may be obtained by writing to **Monsanto Chemical Co., St. Louis, Mo.**

◆

Metal Sawhorse Brackets

Metal sawhorse brackets, enable builders to set up sawhorses on the job without the use of nails, screws, or bolts. Formed steel brackets are available with which ordinary 2 x 4 in. are used for legs, and 2 x 4 in., 6 in., 8 in., 10 in., or 12 in. for the crossbar. Sawhorses can be assembled or disassembled on the job.



Bracketed Sawhorse

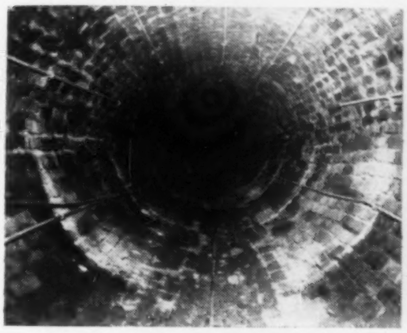
They work well in setting up for all carpentry work, work tables, highway detour blockades, etc. The brackets are zinc plated and packed one pair to an individual carton. **Grand Haven Stamped Products Co., Grand Haven, Mich.**

◆

Concrete Floor Enamel

An alkali-resistant floor enamel, known as Colorfloor XX, has been developed for concrete floors. The unusual, rubber base interior enamel may be used safely for painting basement floors and other concrete floors on or below grade, so long as no hydrostatic pressure exists. Its durable finish resists acids, alkalies, soaps, oils, grease, alcohol, and offers good abrasion resistance. Tremco Colorfloor XX gives a fine, bright appearance to formerly troublesome concrete floors, quickly and easily. **Tremco Mfg. Co., 8701 Kinsman Road, Cleveland, Ohio.**

"GUNITE" RENEWS OLD BRICK SEWERS



These pictures show how we are rebuilding nearly four miles of combination sanitary and storm sewers at Bloomington, Illinois, by lining them with mesh reinforced "GUNITE".

Erosion of mortar joints and dislodged bricks made many sections of these 65 year old sewers both dangerous and inefficient. New "GUNITE" linings will restore them to greater than original strength and result in many more decades of useful service at a fraction of the cost of new sewers.

All work is done without opening streets. Sewer service is maintained by installing temporary flumes or by-passing through relief sewers.

This job and many other profitable uses of "GUNITE" are illustrated and described in our new 64-page General Bulletin B2400. Send for your free copy today.

CEMENT GUN COMPANY
"GUNITE" CONTRACTORS
GENERAL OFFICES—ALLENTOWN, PENNA., U.S.A.
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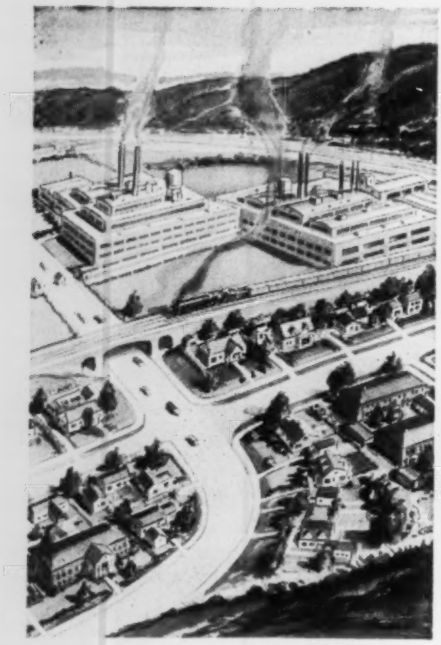

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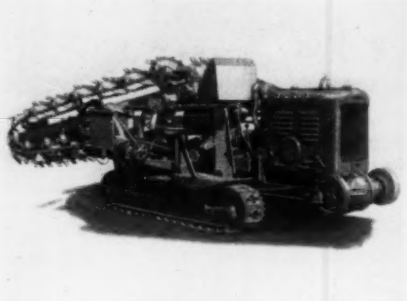
Buckeye 406 Ditcher

THE PILOT MODEL Buckeye 406 general utility ditcher introduced recently, has undergone refinements and is now in full production. The 406 is of the boom type. All welded box section boom telescopes; lower section nests in upper section for 6 ft digging depth. Fully extended boom digs to 8 ft depth. Diagonal boom affords faster penetration in starting a cut and provides undercutting of walks and drives. Ditch from 17 in. to 24 in. wide, can be rapidly cut. Bucket cleaner insures the removal of spoil and full bucket loads. Rooter point speeds are 91 ft and 202 ft per min. Road speeds up to 3.38 mph. Machine digs forward or reverse. This model is ideal for municipal work, utility companies, highway drainage, telephone conduits, railroads, and other ditching jobs. **Gar Wood Industries, Inc., Findlay Div., Findlay, Ohio.**

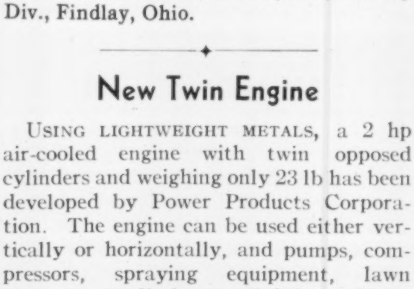


Buckeye Ditcher

◆

New Twin Engine

USING LIGHTWEIGHT METALS, a 2 hp air-cooled engine with twin opposed cylinders and weighing only 23 lb has been developed by Power Products Corporation. The engine can be used either vertically or horizontally, and pumps, compressors, spraying equipment, lawn mowers, small boats, lighting plants, bicycles, and scooters are only a few of the applications which the designers envisage. Lightweight and compact design have been obtained without sacrifice of ruggedness. Special attention has been given to the carburetor and magneto, and the engine starts easily, operates smoothly and without stalling even at tilts up to 45°. **Power Products Corp., Grafton, Wis.**



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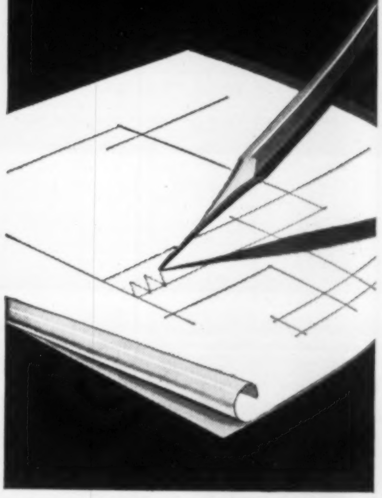

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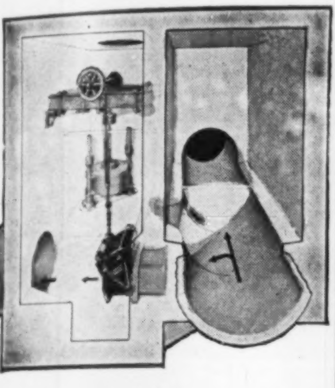

Fig. B-19

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Descriptive Bulletins and Engineering Data Available Upon Request.

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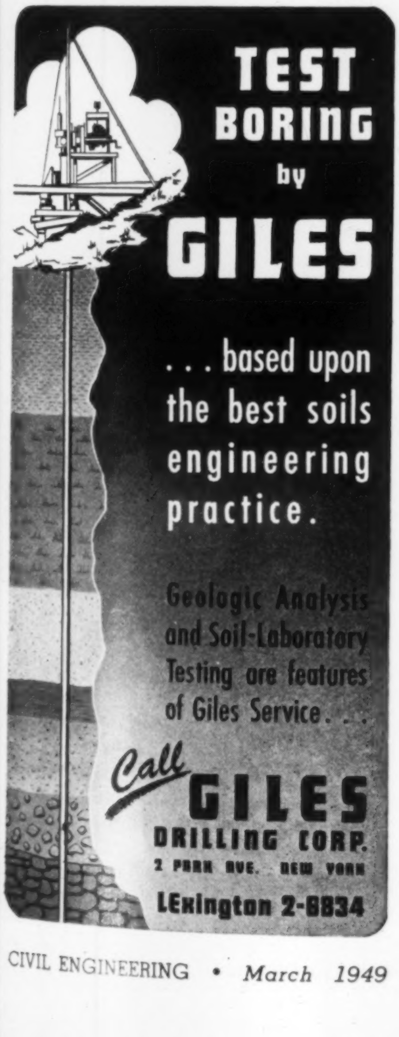

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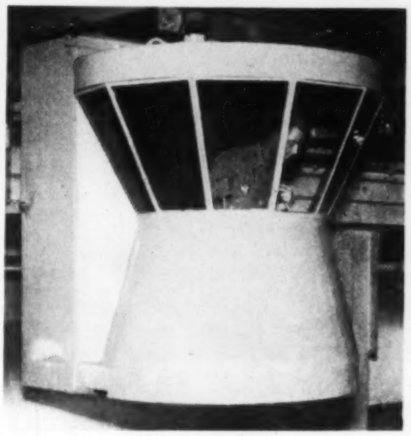

New Crane Cab

All crane movement is governed by a slight pull or push on short, ball-tipped levers connected to low-voltage multipoint time-delay speed controls. The cab is weather proof and may be provided with air-conditioning, telephone communication, and fluorescent lighting if desired. **Whiting Corp., Harvey, Ill.**

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"Self-Latching" Hinge

An ingenious device that adds to any conventional butt-hinge the function of a latch spring, has been introduced by the Latchinge Corporation. It is not only self-latching, but is also self-aligning. Both leaves of the hinge are slotted to permit the insertion of a simple "cam" like design of a "U" shaped, tempered spring, made from flat spring steel stock. One end of the spring is anchored in the door jamb. The other end, the curved, or "cam" side, compresses into the hinge slot. The spring then releases, and latches, by the manual closing of the door. Latchinge is installed like any other butt-hinge, except that a mortise, the depth of the spring insert, must of course be provided. Sagging or warped doors, after years of use, present no "out-of-alignment" latching problems. **Latchinge Corp., 9100 Roselawn Ave., Detroit 4, Mich.**

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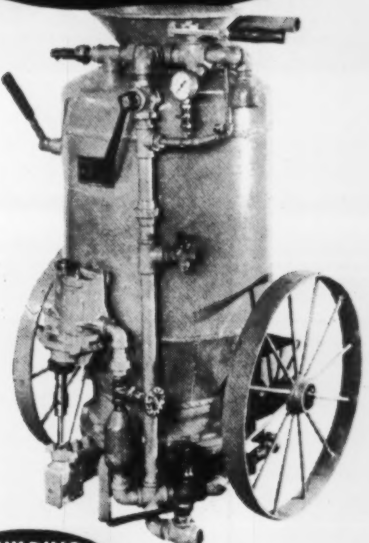

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Literature Available

ACCO PRODUCTS—Booklet, No. DH-509 lists the principal products manufactured by the American Chain and Cable Company. A short introduction explains what their famous ACCO giant trade mark symbolizes. A key index outlines the alphabetical arrangement of the book. Each heading has an illustration of a principal product. **American Chain & Cable Co., Inc., Bridgeport 2, Conn.**

BATCHING PLANTS—Three types of Heltzel batching plants are described in Bulletin J-37. Included in this publication are all recent improvements in central mix, transit mix, and concrete products plants, and accessory equipment. Data, specifications, and illustrations are arranged for easy interpretation and to present useful ideas to operators. **Heltzel Steel Form & Iron Co., Warren, Ohio.**

CONCRETE IMPROVER—A 4-page booklet describes the profitable application of a concrete improver, called Portite, that is new on the market. It discusses laboratory and field findings that may be of use in designing better concrete, cement plaster, and mortar. **Hopper Products, Inc., 12 E. 41 St., New York, 17, N.Y.**

FASTENERS—An attractive booklet on fasteners, designated as Volume 5, No. 2, is offered. Pictures of fasteners used in construction and detailed information on the new locking thread stud, strength of large bolts and rolling screw spikes are included in this worthwhile offer. **American Institute of Bolt, Nut & Rivet Manufacturers, Cleveland 15, Ohio.**

HOSE COUPLINGS—A new brochure describing and illustrating the more important types of Le-Hi hose couplings for use with air compressors, pneumatic tools, rock drills, pumps, pile drivers, etc., on the construction job, has just been issued by the **Hose Accessories Co., Lehigh Ave. at 17th St., Philadelphia 32, Pa.**

TRAVELER CRANE AND EXCAVATOR—A catalog, No. 1248, pictorially illustrates the mobility and versatility of the Byers traveler, model "61W" $^{1}/_{2}$ cu yd and model "71W" $^{5}/_{8}$ cu yd excavators and cranes. This 24-page catalog, also shows the adaptability of the machinery to either construction work or a factory materials handling job. **The Byers Machine Co., Ravenna, Ohio.**

THERMOCOUPLE AND PYROMETER ACCESSORIES—Bulletin No. P1238, contains 56-pages of detailed information on thermocouples, protection tubes, and other pyrometer accessories. A technical section, described as the "Users' Manual," contains engineering handbook data on such subject as factors affecting thermocouple life, corrosion and poisoning, reproducibility, and insulation. Tables of calibration data for the commonly-used basemetal and rare-metal thermocouples is included in the bulletin. **The Bristol Co., Waterbury 91, Conn.**

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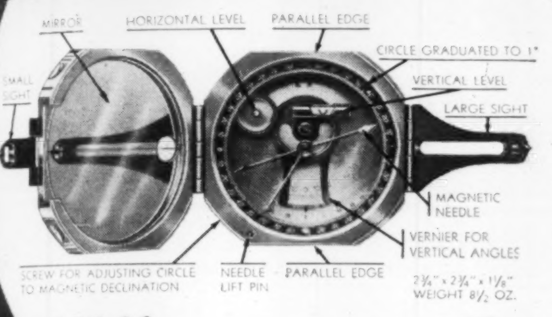

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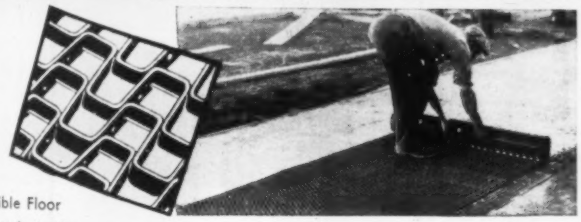

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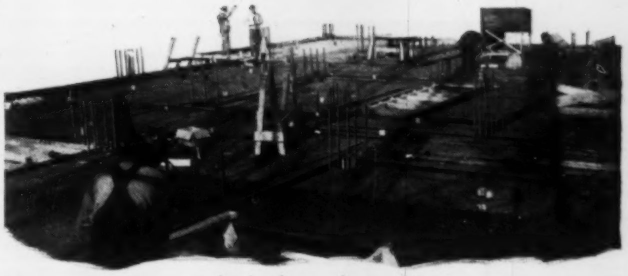

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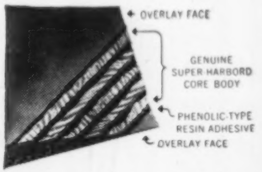

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Snow Plow Wax—A 4-page booklet gives detailed descriptions and directions for easy application of snow plow wax. The booklet points out that this wax prevents snow from piling up on the plow and eliminates costly clearing delays and breakdowns. The product is also recommended for use on dump boxes and bodies of trucks used for hauling snow. **Pennsylvania Refining Co., 2686 Lisbon Road, Cleveland 4, Ohio.**

Pumps—The 7M and 10M models of Rice self-priming, centrifugal pumps are described and illustrated in a bulletin just published. The two sizes are the most popular in the self-priming, centrifugal pump field. Further information on a number of proven features of the pumps which assure high efficiency, high capacity, and dependable operation are included in the booklet. **Rice Pump & Machine Co., Milwaukee 4, Wis.**

Galvanic Cell Corrosion—Reasons for galvanic cell corrosion, as well as methods for helping to overcome it, are contained in a new booklet. The booklet includes drawings and other essential illustrative material. Its seven and one-half pages are designed to provide the production man as well as the engineer with brief but informative material, based on more than forty years of study into this and other phases of corrosion. **The International Nickel Co., Inc., New York 5, N.Y.**

Insulation Adhesives—An illustrated Reference Manual on sealers, surface coatings, cements, mastics, emulsions, and other adhesives for use with various types of insulation in both industrial and marine applications is offered. This 16-page manual gives a detailed discussion of the basic properties and uses. A reference chart which summarizes bonding and drying times, colors, temperature limits, types of thinner and pertinent application data for each type of adhesive material. **Benjamin Foster Co., 4629 W. Girard Ave., Philadelphia 31, Pa.**

Lumber—"Where to Buy" is a publication which reflects the constant progress of the West Coast lumber industry toward providing dependable industrial and home construction lumber to meet the demand. Information contained is designed to help the lumber buyer. It contains a listing of lumber and wood pipe manufacturers, loggers, timber fabricators and treaters; detailed information as to capacity, facilities, species and lumber items, and a list of wood-conserving by-products. **West Coast Lumbermen's Assoc., 1410 S.W. Morrison St., Portland 5, Ore.**

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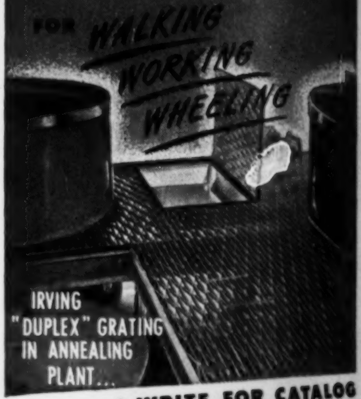

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